THE MARINE REVIEW

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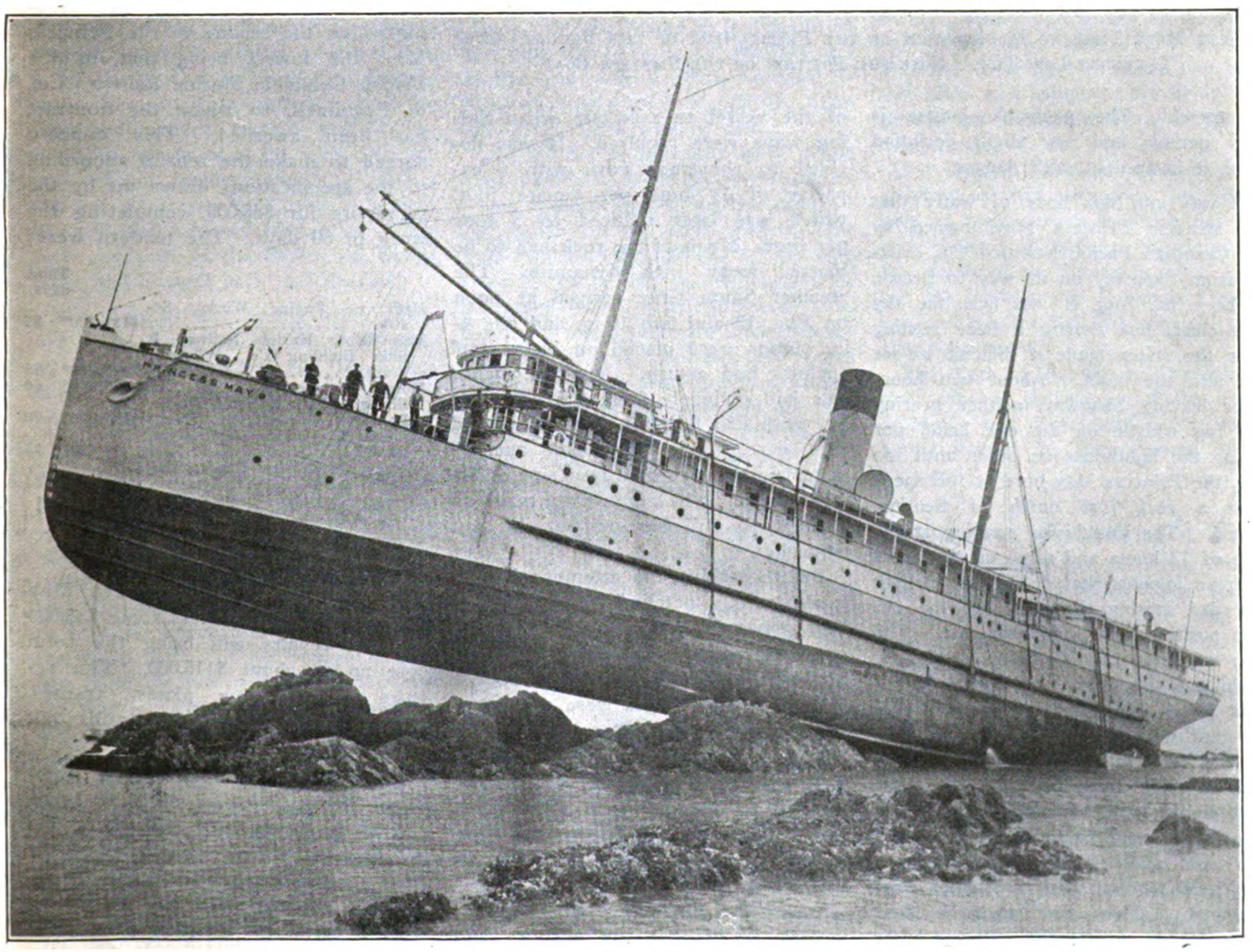
STRANDING OF PRINCESS MAY

LET us bring to the mind's eye for a moment a map of Alaska. We are concerned just now only with the extreme southern part of this territory, that long, narrow strip of land, beginning about latitude 60 and longitude 140 and extending south along the side of Canada. Accompanying this strip on the west, you see hundreds of islands, known to the world as the wonderfully picturesque Thousand Islands. All of this is counted part of Alaska. In the north end of this tract just described is situated the city of Skagway. Looking south from this city, we see a long, narrow, rough band of water—Lynn Canal, which forms only a part of one of the most beautiful water routes in the world. Thousands of excursionists come to these waters every year to feast on the wild, lovely beauties of the surrounding country. The pleasure seeker, however, forms only a very small



A GRAPHIC PHOTOGRAPH OF THE STRANDING OF THE STEAMER PRINCESS MAY ON SENTINEL ROCK.

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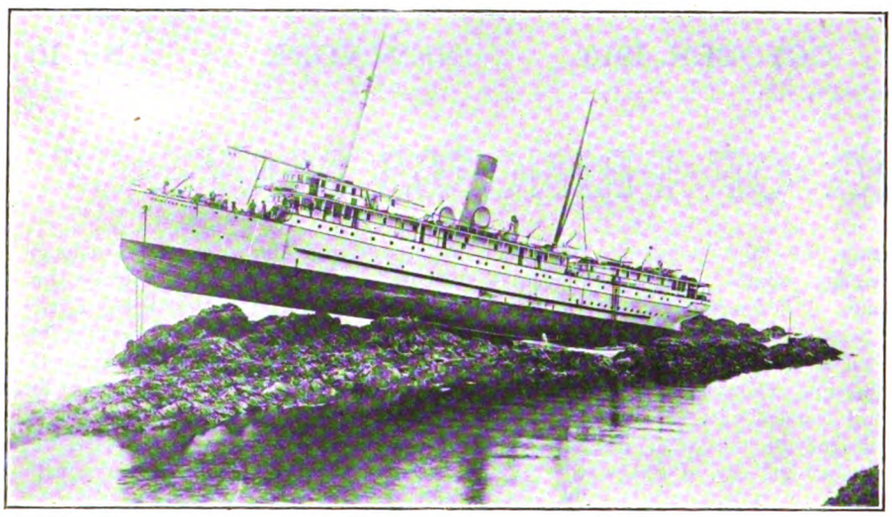
part of the traffic, for commerce is heavy along this route. To get to and from Skagway, it is necessary to follow Lynn Canal. This pass has a width varying from one-half to one mile. The shores are steep and rocky, falling perpendicularly to the water and all along the course are reefs and small islands that are nothing more than huge rocks just barely or not quite reaching the surface of the water. All of this adds much to the picturesqueness, but nothing at all, needless to say, to the safety of travel. The navigable course is very narrow and any slight deviation from it is frought with danger.



A YET MORE STRIKING ILLUSTRATION OF THE PREDICAMENT OF THE PRINCESS MAY, TAKEN AT LOW TIDE. NOTE THE POSITION OF THE SMALLER BOAT.

It was into this body of water that the steamer Princess May, owned by the Canadian Pacific Railroad Co., started from Skagway on its way to Seattle at 12 p. m., Aug. 5. At first, the sky was clear, but shortly a haze settling over the water made it difficult to see far into the night. About two hours after leaving Skagway, neither hearing the fog whistle on the one hand, nor seeing the lighthouse on other until too late, the Princess May bore at full speed onto a reef just north of Sentinel Island. The vessel was running at the rate of 12 knots and came on the rocks with an impetus that drove her up high and dry, raising the bow into the air. The position was a peculiar one. The ship was held on either side so that it could not slip over. At high tide, the hold filled with water. At low tide, the hull was all quite dry. The sides of the reef fall away abruptly 50 ft. and anything happening to loosen the boat would have sunk her at once, for in grinding over the rocks a long jagged tear was made in the single bottom, and it was found that 120 plates were damaged. The crew handled their work quickly, quietly and well and order prevailed. The passengers were taken ashore, suffering nothing more than some discomfort. Signals of distress were promptly answered and the salving tug Santa Cruz, of Seattle, was hastened to the scene of the accident.

The Salving of Princess May.

The salvage feat, as difficult as it was unique, was accomplished by Capt. W. H. Logan, special agent of the London Salvage Association. The first work was to calculate the weight of the vessel to ascertain what sliding ways were required. It was decided to construct ways with a capacity of 11 tons per square foot, which was later reduced to 5 tons per foot. Much of the rock had to be blasted away with dynamite. The steamer Santa Cruz arrived at noon on Aug. 13 and two 10-in. and one 4-in. pumps were placed on board, and anchors laid astern. A 5-ton anchor was laid obliquely from the port side aft, with 250 fathoms, part cable and part wire. Two additional anchors were laid to starboard on a single 250-fathom line. The Santa Cruz made an attempt to pull her off but did not move her.

Before making the attempt, the hull was carefully patched. There was a hole about 50 ft. long and about 18 in. wide on the starboard bow and other holes on the port side about 4 ft. long. Both bilges were stove and there were holes under the engines and boilers. A large number of holes were made amidships by the steamer settling on the rocks at every tide. The majority of the holes were comparatively small, but of irregular shape.

When the patching was complete, it was found that the anchors and hawsers were not heavy enough and that the Santa Cruz could not move the vessel. The British Columbia Salvage Co.'s steamer William Joliffe was accordingly sent for and started north. Heavier anchors were laid out and when the sliding ways were ready, the Santa Cruz and the Joliffe made another attempt to pull the ship off, which was ineffectual and a third pull was taken at midnight on Sept. 2 when the tide was highest and the steamer moved about 60 feet and at noon the following day another haul was made and she slid into deep water, the pumps keeping her afloat.

The wreck was towed to Juneau and thence to Esquimalt, making but little water during the long tow from the north. Within 30 hours after the wreck was floated, one of the heaviest gales of the season occurred and had she been on the reef at the time it would probably have pounded her to pieces.

The Princess May's position on Sentinel island was unique and that there was no break in the hull speaks well for her construction. The floating of the ship was the thirty-second successful salvage job completed by Capt. Logan. Seven bids were submitted on the repairs of the Princess May, the lowest being that of the British Columbia Marine Railway Co., of Esquimalt, to whom the contract has been awarded. This concern agreed to make the repairs according to the specifications drawn up by the surveyors for $85,000, completing the work in 80 days. The tenders were:

		Time, days.
Heffernan Engine Works, Seattle	$131,200*	85
Hall Bros. Marine Railway & Ship Building Co., Winslow, Wash.	120,000*	95
Moran Co., Seattle	125,000*	60
Willamette Iron & Steel Works, Portland, Ore.	105,000*	90
Wallace & Jenkins, Vancouver, B. C.	98,750	76
Victoria Machinery Depot, Victoria, B. C.	94,300	84
British Columbia Marine Railway Co., Victoria, B. C.	85,000	80

*Including duty 25 per cent.

The salvage of the Princess May has cost the underwriters some $35,000 and the repairs will bring the total cost up to about $115,000. The repairs include new plates, frames, beams, propeller bracket and tail shaft.

Princess May is a steel twin screw vessel, 250 ft. long over all, 34 ft. beam, and 18 ft. depth, 1,394 tons gross and 697 tons net. Her engines are of the triple expansion type, developing 250 h. p. She has 82 staterooms, providing separate berths for 164 passengers. She

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is known as one of the speediest vessels on Pacific coast.

Princess May's History.

As the Princess May sat there on the rocks, patiently waiting for some one to help her off, had she been able to speak a language understood by mortals, she could have told many interesting and wildly exciting stories. She was built at Newcastle-on-Tyne in 1888 and christened Cass. Since then, her career has been filled with adventures. Never has she been known as a hoodoo ship, however, for she has been very fortunate at all times and though her escapades were quite out of the ordinary, she always came through them without being very badly hurt. Her maiden trip was to the Orient by way of the Suez canal. While proceeding through the canal, the mate manhandled one of the crew of Chinamen, depriving him of his queue. Mutiny arose and the officer were forced to take shelter on the bridge. Their signals of distress were answered by the authorities ashore, but not before the decks ran with blood.

Arrived at Shanghai, it was found that the ship did not pay dividends to her owners and she was tied up. A firm of French adventurers opened negotiations for the purchase of the vessel. The government officials held out for a high price and the would-be purchasers decided to close matters summarily. They procured a captain and loading the ship quietly at night with coal, set out without further ceremony. When at sea, they repainted the ship and changed her name to Ningchow. They were captured in the harbor of Hongkong and brought back to Shanghai.

Later on, as the Hating, while plying her trade in the Orient, she was boarded by Chinese pirates and again her decks were covered with blood, but the pirates were soon repulsed.

For a little time her life was quiet. Then, one year after she was purchased by her present owners, she ran aground on the rocks of Texada Island, north of Vancouver. She was running in a heavy fog and the pilot noticed that she was driving for some huge rocks, just in time to swerve aside enough to save her from them, but not enough to save her from the low reef and at low tide she was left high and dry in very much the same position as that she took on Sentinel Island. The damage to her hull at that time was greater than in this last case, but she was soon floated and repaired, ready for work.

From that time to this, her life has been fairly uneventful. It is expected that it will take three months to put her in working condition once more.

Steamship El Sol's First Trip

THE steamship El Sol, the latest addition to the fleet of the Southern Pacific Co., Atlantic Steamship Lines, operating between New York and New Orleans and between New York and Galveston, arrived at New York at 12:00 m., Sept. 12, after a very satisfactory voyage to Galveston and return.

The El Sol is one of the four vessels authorized by the Southern Pacific company last year and is claimed to be the finest and fastest exclusively freight ship in the world. Her sister ships are the El Mundo, El Oriente and El Occidente, which will be placed in commission within the next three months.

These vessels are of a slightly different type from the ships operated between the Port of New York and Galveston at the present time, and present a very attractive appearance.

The officers' and crew quarters of the El Sol are unusual in their appointments for a freight vessel, and are convenient and handsomely fitted out. She is fitted with the most modern appliances known to marine architecture and is of the following general dimensions: Length, 430 ft.; beam, 53 ft.; depth, 36 ft.; cubic cargo capacity, 425,000 ft.; dead weight cargo carrying capacity, 5,500 tons; mean draught, 25 ft. She will carry 15,000 bales of cotton.

The El Sol is propelled by a single screw, which is driven by a vertical inverted triple-expansion surface condensing engine of the most modern type with cylinders 34½, 57 and 96 in., with a stroke of 60 in., and is capable of indicating 6,000 h. p. at full speed. The boilers, of which there are three in number, are of the double-ended Scotch marine type with four Morrison suspension furnaces in each end, and are built for a working pressure of 200 lbs. per sq. in. The boilers are operated under Howden's heated system of forced draft. The vessel was built by the Newport News Shipbuilding & Dry Dock Co., at Newport News, Va.

The first voyage of the El Sol was in the nature of an owner's trial and demonstrates her to be one of the most modern and efficient vessels on the Atlantic coast. She left New York at 12:30 p. m., August 27, and despite the fact that she ecountered hurricane weather and considerable head current, she arrived at Galveston at 7:40 p. m., Sept. 1, 12 hours ahead of schedule. On the return trip, the vessel sailed from Galveston at 7:30 p. m., Sept. 7, and arrived at New York at 12:00 m., Sept. 12, 18 hours ahead of schedule. Her average speed for the round trip, from Bar to Bar, was 16.108 knots. The fuel consumption both southbound and northbound was at the rate of 1.443 lbs. of coal per i. h. p. The vessel carried a full cargo of miscellaneous merchandise in each direction.

Suction Dredge for Honolulu

The Standard American Dredging Co., of San Francisco, is having a suction dredge built by the St. Johns Ship Building Co., of St. Johns, Ore., for use in Honolulu. The dredge is 135 ft. long, with a 40-ft. beam and a depth of 12½ ft., with a 20-in. suction pipe. Power will be supplied by Babcock & Wilcox water tube boilers and Allis Chalmers steam turbines. All the machinery will be installed in Honolulu, the hull being towed across the Pacific, from Portland. The dredge was designed by the Standard American Dredging Co., and the hull is being built and the machinery installed under the supervision of Wm. S. Brusstar Jr., of San Francisco.

Very little work is being done by any of the ship building firms in Portland at the present time, either in the repair line or in new work. The Port of Portland is in need of more tow boats and plans and estimates are being considered for a stern-wheel boat for the river service.

But one bid has been received by the government engineers for the 600,000 tons of rock, needed to finish the jetty now being built by the government at the mouth of the Columbia river. The bid was made by the Columbia Contract Co., and totalled $681,750, and will probably be accepted.

The Port of Astoria is awaiting the final data on the survey of the harbor from the war department, before taking action toward the improvement of the harbor.

Destroyer Paulding's Trial

The torpedo boat destroyer Paulding, built by the Bath Iron Works, Bath, Me., underwent her trial recently, the results being tabulated herewith:

	16-knot.	25-knot.	4-hour.
Duration of trial, hours.	12	12	4
Mean revs. per minute.	368.4	623	903
Speed in knots	15.9	25.25	32.80
Turbine horsepower ...	1,465	7,284	17,000
Water per hour, turbines and aux., lbs.....	30,932	105,515	218,414
Water per turbine H. P. per hour, lbs.....	21.12	14.48	12.85

Greiling Bros., Green Bay, Wis., were the lowest bidders for building reinforced concrete caissons and pile pier at Racine, Wis. Their bid was $149,468.

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Passenger Steamer La Touche

THE great and rapidly increasing trade between Puget Sound and Alaska ports is no better indicated than by the vessels being built and added to the fleet of carriers operating between these points.

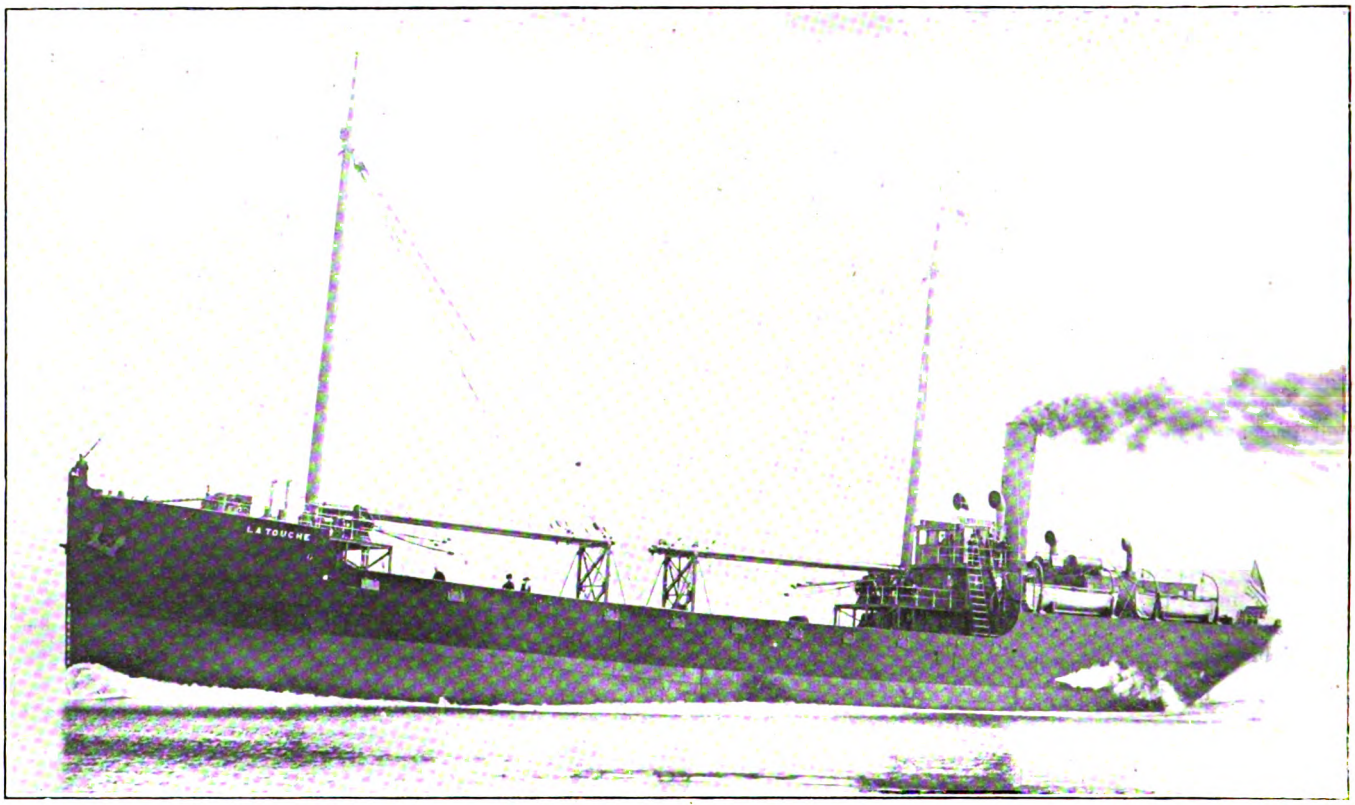
Another important addition has been made by the completion of the freight and passenger steamer La Touche for the Alaska Steamship Co., Seattle. La Touche is a single screw, steel vessel, 250 ft. over all length, 41 ft. beam, 19 ft. 3 in. depth. Although built primarily as a general freight carrier, there are accommodations for fifteen first-class passengers in a house on the poop deck, and on the starboard side under the poop are accommodations for seventy-five steerage passengers. The latter quarters are fitted much better than the average steerage compartments.

Apart from her passenger accommodations, La Touche is very similar in design to the steamships Riverside and Stanley Dollar, operated by the Robert Dollar Co., of San Francisco. The gross tonnage of the La Touche and Stanley is 1,838 and 955 net. Special care has been taken in providing equipment for handling freight easily. All machinery is aft under the poop deck, with quarters for the officers and crew on the port side under the poop and under the forecastle deck. Wireless equipment is also provided for. The cargo hatches, 10 ft. 6 in. by 32 ft., are two. The two steel masts are each provided with two five-ton derricks and one 20-ton derrick. Winches for handling cargo are installed on the extensions of the forecastle and poop decks. Power is supplied by one vertical triple-expansion engine, designed and built by Moran Co., with cylinders 17, 28 and 47½ in., with a stroke of 36 in. and about 1,000 i. h. p. Steam is generated by two single-ended boilers, 12 ft. diameter and 10 ft. 9 in. long, fitted for oil fuel.

The building of La Touche was a record for the Pacific coast. The contract for her construction was let Feb. 11, 1910; she was launched Aug. 25, and made her trial trip and was accepted by the Alaska Steamship Co. on Sept. 8. On her trial, La Touche developed an average speed of 12 knots, two knots above that called for in the builders' contract.

When launched on Aug. 25, the ship was nearly complete, with all machinery in position. She was christened by Jennette Lawrence Young, the ten-year old daughter of J. H. Young, president of the Alaska Steamship Co. After the launching, a lunch was served by the builder, at which a large number of guests were present.

Moran Co. have been extremely busy for the past six months, having completed the Kulshan, as noted in THE MARINE REVIEW for August, the La Touche, and having under construction two submarine torpedo boats, the Pickerel and Skate, besides minor repairs to a number of ships. About 400 men are at present employed in all departments.



PASSENGER STEAMER LA TOUCHE, OF THE ALASKA STEAMSHIP CO.'S FLEET.

Producer Gas Yacht

The first yacht having producer gas engines for propulsion, to be built in Scotland, is now on the stocks of Messrs. MacLaren Bros., yacht builders and motor engineers, Dumbarton, and will be launched early in October. It is to the order of Messrs. Mavor and Coulson, electrical engineers, Glasgow, whose H. A. Mavor is well known to naval architects and engineers the world over for his study of and proposals in connection with turbo-electric propulsion of vessels, and is intended to be used for experimental work designed to assist in solving this problem. Built of steel, the vessel is 54 ft. long by 10 ft. 6 in. beam, and while having good living accommodation, the feature of the little craft will be her engine room and suction-gas producer plant, which are grouped aft, and entirely isolated from the living quarters. It is understood that the engine will be of vertical four-cylinder design, of at least 50 h. p., but facts as to the machinery details are not yet available.

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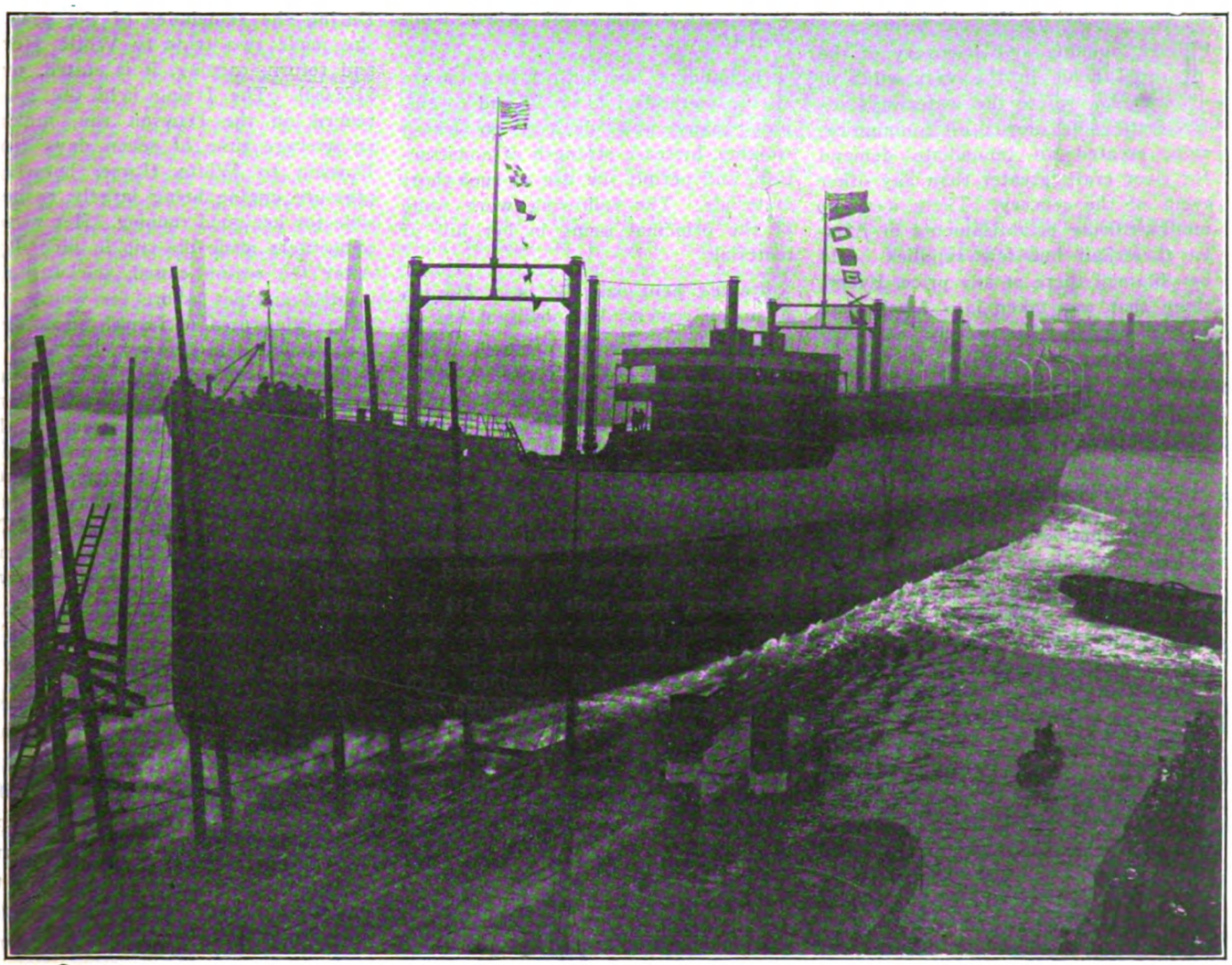
Leviathan American Coal Carrier

BY the courtesy of Sir Raylton Dixon & Co., Ltd., we are able to reproduce a photograph, showing the launch during August of what is said to be the largest commercial coal carrying ship afloat.

She was built at the firm's Middlesbrough yard to the order of the Havana Coal Co., and her carrying capacity will be 8,500 tons. She is named the Berwindmoor, and is the first of a fleet of leviathan coal carriers to run between Chesapeake ports and Cuba. The Berwindmoor is described as the latest creation as a self trimming coal steamer, and she has been designed by Messrs. W. Esplen & Sons, of Liverpool. The vessel is a steel-screw steamer, built on the Harroway-Dixon cantilever principle. Her dimensions are: Length, 425 ft.; beam, 54 ft.; depth, 29 ft. The great carrying capacity of the vessel, namely, 8,500 tons, will be provided for in handling by the latest types of plant. There are to be five holds with large hatchways, 33 ft. by 21 ft., which will afford free play to any kind of grab or bucket from any part of the holds. It will be possible to load the vessel in ten hours, and to discharge her in 16 working hours. She will have eight winches. The engines are triple-expansion, 28 in., 46 in. and 77 in., and are calculated to give a loaded speed of 11½ knots. Special attention has been given throughout to the engine work on account of the tropical trade, in which the Berwindmoor will be engaged, and she will be equipped with Contraflo condensers and evaporators. In all other respects the vessel will be thoroughly up-to-date. She will be lighted throughout with electricity and will carry a wireless installation on the De Forrest system, as well as a submarine signalling equipment.

Bids will be opened at noon, Oct. 31, by the Department of Marine and Fisheries, Ottawa, Can., for the construction of a twin-screw, steel lighthouse tender for the Pacific coast, to be delivered at Victoria, B. C. The steamer will be 200 ft. long, 38 ft. beam and 11 ft. 6 in. deep.



COLLIER BERWINDMOOR FOR THE HAVANA COAL CO.

A Mosquito-Proof Steamer

The first ocean-going mosquito-proof vessel, built for the African trade, is now in commission. Fittings are provided against the intrusion of mosquitoes in the quarters of both passengers and crew. All doorways, side port openings, windows, skylights, ventilators and passages have been provided with mosquito-proof, close-mesh gauze coverings, which, while allowing the necessary ventilation, prevent the admission of the disease-bearing mosquito. Great care has been given to the convenient placing of these fittings to make them readily adjustable. The vessel is 262 ft. long, has 38 ft. beam, and is 18 ft. 3 in. in depth. The plan of arrangement adopted was recommended by Prof. Major Ronald Ross, C. B., a recognized malarial expert, whose malarial recommendations are very generally known throughout the tropics.

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Steamer Willie Irving

The following account of the Alaska steamer Willie Irving was prepared for THE MARINE REVIEW by Joseph Supple, of Portland, Ore. At the Supple yards have been built a large number of wooden ships in service on the north Pacific coast and many of the stern wheelers that have contributed their share to the early history and development of Alaska. Because of the lack of transportation facilities other than men's backs and dog sleds, it was a problem to transport provisions and tools, to say nothing of anything of the size of an 80-foot boat. The history of the Willie Irving, the first of the remarkable Alaskan fleet, illustrates the difficulties confronting the builders and how they were overcome. From Dawson to White Horse, the distance is 460 miles through a chain of lakes and rivers, which include some of the most treacherous inland waters known. The Irving's record of 7 days between Dawson and White Horse meant an average of nearly 65 miles per day. Chilkoot Pass, from Skagway to Lake Bennett, is some 40 miles long.—EDITOR.

THE opening and discovery of the gold fields in the vast wilds of Alaska, where the waterways offered the sole means of communication, created an immediate demand for river craft, greater than any other event of the century. There were no manufacturing establishments in Alaska then and but few supplies could be obtained there at any price. Everything that was taken into Alaska had to be prepared as nearly complete as possible and so packed that it could be transported by men and dogs on the trails across the hills over the ice and snow.

In 1898 when the rush to Dawson was at its height, I was commissioned to build a stern wheel boat for use on Lakes Bennett and Atlin, and on the Yukon river above the White Horse rapids. A trail had been built across the divide at Skagway, and at this time it afforded the only entrance to lower Alaska over which any considerable amount of material could be packed. The boat was called Willie Irving in honor of a nephew of Capt. E. W. Spencer, who gave the order.

The general dimensions were, length 80 ft., beam 20 ft., and draught 3 ft. Power was supplied by a pair of 7 x 28 in. engines and water tube boiler and she was propelled by a stern paddle wheel. The engines were built principally of cast steel and wrought iron to carry a very high steam pressure. One of the contract conditions was that no piece used in her construction be over 20 ft. long and that no part or package except the wheel shaft be too heavy for two men to take over the trail. Everything was to be made as complete as possible to reduce the labor of reassembling to a minimum. The engines, boilers, and pumps were built by the Marine Iron Works of Chicago. I still have a letter written by Manager Nourse of that company, dated Feb. 14, 1899, in which he says. "The Willie Irving is unquestionably a most successful boat; one of the most satisfactory of her size ever built and yet one which you and I know taxed the ingenuity of all concerned, necessitating the most painstaking care as to details. She has proven a phenomenal bread winner (perhaps I should say diamond winner), even among the big earners of the upper Yukon. As a matter of fact, the transporting of such a boat in small sections over the trail to the lakes is in itself a remarkable feat, even though she should have proven a very ordinary craft when completed."

In building her hull, I had to use all the methods I knew of and to employ many new devices, to lessen weights, increase strength of construction, and permit the use of such short materials. The following were some of the principal items in her bill of material:

Frames, bent oak, 2½ in. x 2½ in., 20 in. on centers; keel, built of 1½ in. x 8 in.; floors, 2½ in. x 2½ in.; knuckle, 2½ in. x 5 in.; decking (main deck) 1 in. x 4 in., tongued and grooved; transom, 2 in. x 12 in.; shelf piece, 2½ in. x 2½ in.; fantail, 4½ in. x 2½ in.; deck beams, 1¼ in. x 2½ in.; frame for freight house, pilot house, and texas, 1 in. x 2½ in.; siding and decking for superstructure, ⅝ in. cedar, tongued and grooved.

Keelsons were built up of 1¼ in. stuff, using two planks for the side and bilge keelsons and three for the center keelsons, laid together with broken joints and bolted through and through with carriage bolts. All the timbers running fore and aft in her hull were made continuous by butt strapping. These timbers were all shipped in sections not over 20 ft. in length.

It was the captain's intention on leaving to use the bent oak frames as runners for temporary sleds to carry the materials over the snow on the trail, loading and unloading the timber as conditions demanded. Not one piece or package containing the materials for this boat and her machinery and equipment was too heavy for two men to transport, with the exception of the wheel shaft, which was hollow and weighing about 400 lb. When the shipment reached Skagway, the captain found that a wagon road was about completed through the pass and on to the lakes. He hurried the boat materials to the toll gate and waited for the road to be opened. He paid on the timber for the Irving the first toll money collected on that famous pass, and reached Lake Bennett in due time, where she was rapidly assembled and put into service.

After making a few trips on the lakes, the impulse to join the rush to Dawson was too strong to be resisted and despite the warnings of the dangers of White Horse rapids and Miles canon, the captain took her to Dawson. She was the first steamer to pass down the river and was one of the first boats put into service on the Yukon above Dawson. Before reaching Dawson, the Irving was sold. During the remainder of the season, she made two trips to White Horse and return, earning, it is stated, over $128,000. The Irving held the speed record on the Dawson run, making an average time of seven days from Dawson to White Horse, her high pressure engine being largely responsible for her good running. Her closest competitors made the trip in nine days. After the season closed, she was dismantled and put ashore for winter, the boiler being used to furnish steam heat for a building in Dawson.

The second and third seasons saw a continuation of her success and splendid service until wrecked the third year. While I have no definite figures available, as far as records show, this little 80-foot steamer during her short life earned over $250,000, a feat so far as I know, without parallel in the history of river navigation.

Pacific Coast Casualties

For a period of about four weeks, beginning with the latter part of July and extending on into August, there has been among the boats plying Pacific coast waters, a succession of mishaps, collisions, and wrecks. In nearly every case the trouble has been attributed to fog. This series of accidents, greater in number than any other for the same length of time, seems to be rather a question for the psychologist in view of the fact that the fogs of this year have been no worse than those of other years. Be the reason what it may, however, a hard fact remains to be faced by the insurance companies—the losses they will have to cover are unusually and disturbingly heavy. Another exceptional feature in this series of marine casualties is the fact that in it there has been almost no loss of life. Even where conditions seemed hopeless and the vessel proved a total

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loss, human life was sacrificed in only one case.

A list of the more recent casualties will suffice to give some idea of what the Pacific shipping has suffered. After having groped about for several days in dense fogs around St. Paul Island, Bering Sea, the United States revenue cutter Perry struck a reef off Point Tonki. The crew worked earnestly to free the ship, but within a few hours were forced to transfer to the Tahoma, which had been summoned by wireless. In spite of all that could be done for her, the Perry pounded about on the rocks until completely demolished.

The gasoline schooner Helen Johnston left Seattle in April to trade with Eskimos in north Alaskan waters. Many narrow escapes dotted her log through the spring and early summer, but she continued her work until recently a heavy storm drove her on the rocks off Point Hope and ship and cargo were total losses. The shore at the point of the wreck is barren and the crew were fortunate in getting away with their lives.

Schooner James Rolph, owned by Hind, Rolph & Co., stranded during a heavy fog Aug. 2, near Point San Pedro. She was bound for the Hawaiian Islands. All efforts to release her have been abandoned.

Helga, a British wooden barkentine of 1,254 tons, built in Norway in 1892, grounded on the Island of Kauai, Hawaii, Aug. 11, was abandoned by her crew and is reported fast going to pieces.

Schooner Annie E. Smale, from Australia, with coal for San Francisco, went ashore in a dense fog and is a complete loss. The coal was insured but not the ship. The crew were picked up by the steamer M. F. Plant.

Near Port Townsend, Wash., with the weather bright and clear, but probably thrown from her course by a strong tide, steamer Dode struck a reef in such a way as to make it impossible to save her. She has been abandoned.

Besides these total losses, there have been a great many other casualties more or less serious. On Aug. 5, Princess May, a passenger steamer, owned by the Canadian Pacific railroad, struck a reef at north Sentinel Island. Her eighty passengers and crew of sixty-eight were all uninjured. It was at first supposed that it would be an easy matter to release her, but her floating proved a matter of considerable difficulty.

Aug. 2, steamer Chippewa collided with the steamer Albion off West Point, near Seattle. Though the Albion was badly damaged, her passengers were uninjured and were taken off by the Chippewa, which then beached the Albion. An Aug. 10, the Chippewa, while running in a thick fog, struck Davidson's reef and was so severely damaged that she will be off her route for some little time.

U. S. Cruiser Chattanooga was towed into Bremerton from the Hawaiian Islands by the fleet collier Prometheus. She was disabled in Hawaiian waters by the breaking of her propeller.

Japanese steamer Awa Maru, shortly after her departure for the Orient, broke her main steam pipe and found it necessary to stop at Victoria, B. C., for repairs.

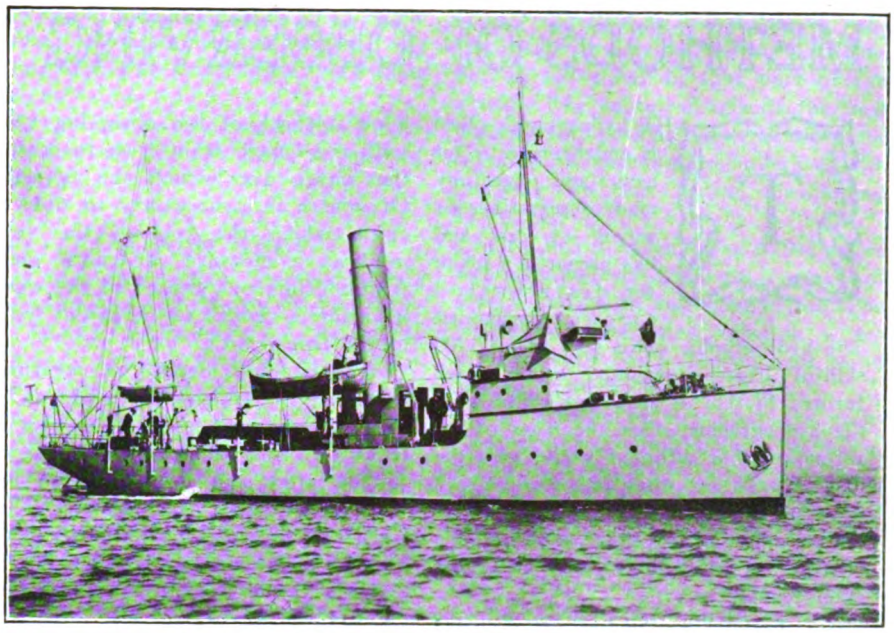
Reporting herself only slightly damaged, the excursion steamer Sechelt, which went ashore in the Narrows, near Vancouver, B. C., was floated Aug. 10. The passengers were badly shaken, but none of them injured.

Steamer Newport, while bound up the Columbia river, struck the beach on July 29 and was floated only with considerable difficulty.

The Potter, carrying passengers on the Columbia river, collided with the steamer Oklahoma, which was towing a barge. A 40-ft. hole was torn in the side of the Potter.

The British steamer Riverdale, bound for China, struck in Madison Bridge Passage at Portland, July 28. She was not seriously damaged.

Of those aboard the vessels, above mentioned, none were killed or injured. The crew of the steam schooner Phoenix, whose boilers blew up at sea, Aug. 10, about ten miles north of Point Arena lighthouse off the Mendacino coast, were not so fortunate. The chief engineer, second mate, and two firemen were either killed outright or died soon after the accident from injuries sustained.



MINE-LAYING STEAMER FOR THE PORTUGUESE NAVY.

Mine Laying and Torpedo Regulation Vessel

Messrs. J. I. Thornycroft & Co., Southampton, have built an interesting vessel for the Portuguese navy, a twin-screw steamer specially designed for laying submarine mines and testing and regulating Whitehead torpedoes. Her principal dimensions are: Length over all, 117 ft.; breadth, molded, 19 ft. 6 in.; depth, molded, 11 ft.; draught, 6 ft. 9 in., and her speed is 12½ knots.

For mining purposes the vessel is equipped with shearlegs at the stern worked by a combined electric and hand winch. For torpedo-testing and regulating, the vessel is provided with a revolving 18-in. torpedo-tube amidships, and at the break of the forecastle with two torpedo-cages (or skeleton tubes made of angle bars, etc.) which can be lowered into the water by means of special davits, so that the torpedoes can be started under water by means of their own power on pulling a starting lever.

There is a steam steering gear controlled from the bridge and a hand gear aft. Electric lighting is fitted throughout, and a search-light on a portable stand on the bridge.

The bridge is placed at the break of the forecastle, and the front part of it forms a breakwater.

The vessel is equipped with three small boats, viz., one Thornycroft 20-ft. motor launch, one 20-ft. life boat, and one 12-ft. dinghy.

The machinery consists of two sets of tri-compound surface-condensing engines, and one Thornycroft water-tube boiler working under natural draft.

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METHODS OF OBSERVING WAVES AT SEA

THE hydrographic office is endeavoring to get new and carefully made observations of waves at sea and has prepared a blank for distribution among navigators. The hydrographic office says that if 100 skillful ocean navigators would each furnish 10 sets of wave observations to the hydrographic office, the mass of information thus afforded would give the office a basis for study that might prove of value to ship builders, masters, stevedores and the traveling public. The blanks will be sent to any navigator upon request.

In response to numerous requests received from mariners regarding the best methods of observing the heights, lengths, and periods of sea-waves, the angle and period of rolling, and the information desirable to be recorded concerning seismic waves, the Hydrographic Office recommends the following:

Wave Heights.

These should always be taken from trough to crest. The best method that is available to the mariner who is without special instrumental equipment is to climb the rigging or otherwise place himself at a height above the deck sufficient for him to just see the horizon over the top of the wave-crest when the ship is in the trough. In some cases it may be necessary for the observer to lower himself below the level of the upper deck and make his observations from some position on the side of the vessel, as for example through a port. Thus, if the deck is 15 ft. above the water line and the observer must mount 10 ft. above the deck in order that he may just see a wave-crest level with the horizon, the height of the wave is 25 ft. above the water line. If, at the time of observation the vessel rides upright in the trough of the wave, the observed height will be the required height of the wave from trough to crest without any correction or allowance whatever. Three or four sets of ten observations each, taken in this way, will give an excellent determination of the average height of the waves running during the period of the observations.

Wave Lengths.

These should always be taken from crest to crest. With the exercise of care, good determinations may be obtained by direct comparison of the known length of the observing vessel with the length from crest to crest of the waves over which she is riding. Of course it is necessary to note the angle which the keel of the vessel used as a measure of length makes with the line of advance of the waves, in order to reduce the apparent length to the true length.

Another easy method of measuring wave lengths consists in towing a log line astern of a vessel and noting the length of line when a buoy attached to the after end floats on the next wave crest abaft that on which the stern of the vessel momentarily floats. For its successful application the observing vessel should be placed end-on to the waves, or else allowance made for the angle the log line makes with the direction of the ship's course.

Wave Periods and Wave Lengths.

Both may be determined by one process as follows: Two observers are placed as far apart as consistent and at a known distance from each other on the deck of the observing vessel. At each station a pair of battens is erected so as to define, when used as sights, a pair of parallel lines at right angles to the ship's keel. The observers at both stations note, by watches that have been previously compared, the instant when a wave crest crosses the line of sight; they also note how long an interval elapses before the next wave crest crosses their lines. Comparing their records they determine (1) the time (say t seconds) occupied by the wave crest in passing over the length (l ft.) between their stations; (2) the time (say t_1 seconds) elapsing between the passage of the first and the second crest across either line of sight. The latter is the "apparent period" of the waves.

Suppose the ship to be advancing at a speed of V ft. per second *toward* the waves, her course making an angle of a degrees with that course which would place her exactly end-on to the waves; then expressing these conditions algebraically:

Apparent speed of wave (ft. per sec.) $= \frac{l}{t}$

Real speed of wave (ft. per sec.) $= V_1 = \left(\frac{l}{t} - V \right) \cos a$

Real length of wave (ft.) $= (V_1 + V \cos a)\, t_1 = l \cos a \cdot \frac{t_1}{t}$

Period of wave $\frac{l \cos a}{V_1} \cdot \frac{t_1}{t} = \frac{l\, t_1}{l - Vt}$

In a ship steaming *away* from the waves it is necessary to change the sign V in the foregoing equations.

It is evident that the simplest conditions for observing the lengths and periods of waves obtain when the observing vessel is placed end-on to the waves and is stationary. The true period and true speed of the waves can then be obtained by direct observation, and the lengths calculated.

Very useful observations can be readily made by two observers with an ordinary watch. One observer can keep his eye on the particular chosen point where the crests of successive waves reach the vessel, while the second observer keeps his eye on the watch, as the time draws near for the crest of the wave to reach the vessel, notes and writes down the time when the first observer sings out "Mark!" With practice one observer can make this kind of observation. Whenever possible the method with battens should be given the preference. The times of several sets should always be reported, though three or even two sets would give a good result.

Caution.

Waves usually come in sets, followed by a comparative lull, during which observations may be uncertain, and great care should be taken not to observe any of the uncertain waves. Confused conditions of the sea should always be avoided for observing, and the observations should be reserved for waves that appear in somewhat regular series. Be careful to note the direction toward which the wave is moving and the course and speed of the vessel. With these data the observed periodic times can be corrected for the vessel's motion when the observations are received in the Hydrographic Office. Observers may reduce their own observations if they prefer.

Rolling Observations.

Battens afford the simplest correct means for observing the rolling, and for several reasons are to be preferred to the indications of pendulums or clinometers.

Battens can be employed whenever

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the horizon can be sighted. The line of sight from the eye of an observer standing on the deck of a ship to the distant horizon remains practically horizontal during the motion of the ship. Say a position is chosen on the starboard end of the bridge at which the eye of the observer will be placed; then mark on a vertical batten at the port end of the bridge the height of the eye above the bridge deck as a point of reference. If the distance between the observer and the batten is d feet, the batten can be graduated for an angle of roll θ by the formula—

Vertical set-off on batten in feet = d . tan θ.

In rolling, as in all other observations, accuracy depends upon the care exercised by the observers.

The *period of roll at sea* can be determined by watch quite accurately while observing the angle of roll, taking the mean of the times of a number of distinct rolls.

Special Information Desired With Regard to Waves of Inundation Following Earthquakes.

Much valuable information is lost because observers are not generally prepared to make observations on the occurrence of an earthquake, or are not aware of the points on which information is specially desired. The value of experiences is considerably lessened when recorded after a lapse of time from memory, as compared with those recorded at the time of the occurrence. For these reasons the Hydrographic Office would emphasize for the consideration of all seafaring men the following questions as indicating the particular observations desired to be made of the waves of inundation.

1. What interval of time elapsed between the earthquake and the arrival of the wave of inundation?

2. What interval of time elapsed between the earthquake and the commencement of the draining away of the water of the harbor?

3. By what amount was the depth of the harbor diminished by the recession of the waters after the earthquake?

4. To what distance from the shore did the wave of inundation enter the city or the land bordering the sea?

5. What was the height of the wave of inundation?

6. How many and of what maximum size were the vessels that were stranded by the wave of inundation, and to what distance were they borne inland?

7. Were there any succeeding waves of inundation, and, if so, what period of time elapsed between the successive waves and what were their height?

8. What was the total time of oscillation of the sea until it quieted down?

A New Alloy

A new alloy, called "Duralumin," has been discovered by Messrs. Vickers, Sons & Maxim, shipbuilders, of Barrow-in-Furness. It will be made at Birmingham, England, and will be on the market in October. H. B. Weeks, the chief chemist of Messrs. Vickers' works, has stated that in the course of investigations they had found an alloy which they believed to be superior to anything of its kind hitherto manufactured. The company had decided to manufacture it on a large scale. The alloy, whilst slightly heavier than pure aluminum, is said to be as strong as steel. It can be rolled, drawn, stamped, extended or forged at suitable temperatures. It is less corrodible than other high aluminum alloys under all the usual tests, and possessed altogether many valuable properties. Messrs. Vickers, Sons & Maxim believe there is bound to be a large demand for it, as it is only one-third the weight of brass. The firm have protected this alloy by patents throughout the world. The belief is further expressed that the new metal will revolutionize many trades which manufacture machinery, etc., where weight of metal is often a great drawback, in order to obtain the necessary strength. Mention is made of the bicycle and motor car trade, and even ship construction in this connection.

Ayudante

To remedy the inconvenience and delay which have existed at Callao, owing, among other causes, to the frequent inability to secure lighterage for their vessels calling with cargo at that port, the Pacific Steam Navigation Co. has provided its agents there with a very neat looking and seaworthy little Thornycroft motor launch, the Ayudante, by means of which they will be in a position to ascertain more promptly than has hitherto been possible, the requirements of the vessels, the lighters that will be necessary for discharging cargo and to make any arrangements that may be required. The launch will also be used for the numerous other duties of the agents which are usually carried out by oar-propelled boats.

Its dimensions are 25 ft. by 5 ft. 6 in. with only 18 in. draught. The hull is carvel built of mahogany, and copper sheathed to water line, to obviate the destructive effects on timber of sea water in that part of the world. The motor is one of the new Thornycroft paraffine type, of moderate revolutions, with two cylinders 4½ in. diameter by 6-in. stroke, developing 15 B. H. P.

With this a speed of over 9¾ miles was attained on trial, as a mean of several runs with and against tide. The power is transmitted through a reversing gear to a Thornycroft solid bronze three-bladed propeller.

The fittings of the boat are complete as for a ship's launch, including slings for hanging in davits, brass stanchions and canvas awning, arranged to tilt to either side to allow head room when embarking, oars, rowlocks, motor horn, lamps, fenders, anchor cable, bilge pumps, etc.

In addition to the tiller a steering wheel is fitted handy to the controlling levers, thereby enabling the boat to be managed by one man.

The launch was surveyed during construction by the board of trade and was finally registered at Liverpool under the Merchants' Shipping Act before being dispatched to Peru.

Steamer with Combination Engines

The launch of the passenger and cargo steamer Rotorua, which took place at the ship yard of Messrs. W. Denny Bros., Dumbarton, recently represents another addition to the number of vessels afloat which are propelled by a combination of reciprocating and turbine engines. The vessel, which has been built to the order of the New Zealand Shipping Co., is 484 ft. by 62 ft. by 35 ft. In the Rotorua steam is first admitted to each of two sets of triple expansion engines driving twin-screws, and then passes to a low-pressure center turbine driving the center shaft before reaching the condenser. The contract for this vessel may be taken as a practical proof of the satisfaction with which the New Zealand Company regard the performance in service of the Otaki, the vessel built some two years ago by Messrs. Denny, and fitted with the combination system of machinery.

The Suez canal shares held by the British government, it is stated by John L. Griffiths, United States consul general, London, yielded $66,661,718 in interest and dividends from 1895 to 1909, inclusive.

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A Shameful Exhibit

THE three photographs on the opposite page were taken on Sept. 10, at Winslow, Wash., and show more clearly than any description the effect of shipping eastern coal to the Pacific coast in foreign bottoms and then turning these vessels loose to prey on American shipping. On Sept. 10, there were 17 American vessels of the type shown lying at anchor in Eagle Harbor, Winslow, Wash., idly rotting away. They represent an investment of over $1,000,000, and have a carrying capacity of at least 17,000 tons.

That these idle vessels are not due to a falling off in the total freight tonnage moving to the Pacific coast is shown by the figures on total tonnage on the way, Sept. 10, 1910, as taken from the *Weekly Commercial News*, of Sept. 10, 1910.

Total tonnage on way.	Sept. 10, 1910.	Sept. 10, 1909.
For San Francisco	221,747	179,817
For Portland	57,183	70,485
For Puget Sound	60,893	59,377
For British Columbia	26,063	33,894
For Hawaiian Islands.....	39,816	26,873
	405,702	370,446

This is a balance of 35,256 tons for 1910 over 1909, on the way to the Pacific coast. For the fiscal year ending June 30, 1910, the coal shipped by the United States to the Pacific coast for naval use aggregated 256,947 tons, costing over $1,852,000. This coal was shipped as follows:

To Honolulu:	Tons.	Tons.
In foreign bottoms.....	91,962	
In American bottoms.....	9,637	—101,599
To Mare Island:		
In foreign bottoms.....	11,000	
In American bottoms.....	20,600	— 31,600
To California City points:		
In foreign bottoms.....	44,971	
In American bottoms.....	10,045	— 55,016
To Puget Sound:		
In foreign bottoms.....	68,732	— 68,732
		256,947

Of the total of 256,947 tons, 215,663, or 84 per cent, were shipped in foreign bottoms, and 40,282 tons, or 16 per cent, in American bottoms.

Testing Pacific Coast Coal

IT IS generally known that merchant vessels use Pacific coast coals economically and continuously and get good results from them at a comparatively small cost. There is no good reason why the navy cannot use Pacific coast coal instead of continuing the senseless practice of bringing all its coal from the eastern coast. The navy department has finally decided to make a test of three or more Washington coals for comparison with eastern coal. These tests will be made on the cruiser Maryland on the Pacific and the cruiser West Virginia on the Atlantic, under as nearly identical conditions as possible. Just why the Maryland and the West Virginia should be selected is not clear in view of the facts so clearly stated in THE MARINE REVIEW of June, 1910, under the heading, "A Straw Navy." Be that as it may, the people of the Pacific northwest are awaiting the results of the trials and expecting that fair use will be made of the results obtained. It is admitted that Pacific coal is not the equal of Pocahontas coal for steaming purposes, but an unbiased comparison of the relative costs of the coals used will show an enormous saving over the cost of Pocahontas coal by using Pacific coal.

But there is no hope that the policy of the navy department will be changed in the slightest degree by the proposed coal tests. The department knows now all it wants or needs to know and THE MARINE REVIEW has heretofore published facts and figures regarding the heat values of Pacific coast coals derived from the government's own published reports, made by its own experts, showing that the indispensable eastern coals are only 6 to 9 per cent better than some of the Washington coals. The navy can make as much steam for $1 with Washington coals as for $3 to $4 with eastern coal, and this is true without qualification or modification.

The reasons for using eastern coal are not of an engineering nature nor yet military, as is perfectly understood by all familiar with the subject; they are not even geographical, and statements to the contrary are merely issued for general consumption.

The selection of the Maryland and West Virginia was the master stroke. Two ships of the highest and finest type, yet which limped into San Francisco on their return from an eastern cruise almost complete wrecks in their machinery department, as was fully set forth in THE MARINE REVIEW for June, 1910, because of the inexperience and incompetency of their officers, the chief engineer of one of them, for instance, never having had any engine room experience whatever previous to joining her, and the chief engineer of the other had 15 months. The fleet engineer of the Pacific fleet, under whom these trials will presumably be carried out, has had but a few months' experience as chief engineer and but little more in all his engine room life.

The Pacific northwest owes much to Congressman W. E. Humphrey, of Washington, and G. F. Thorndyke, of Seattle, in securing a test of Pacific coals by the navy department. Almost single handed, they have carried forward the demands of the northwest in the matter of using Pacific coast coal in the navy.

It is greatly to be feared that those who think that the proposed trials, which after all are merely a cheap attempt at shutting off proper criticism, will develop anything worth knowing, are doomed to nothing but disappointment.

In connection with the proposed tests of Pacific coast coal by the United States navy, the following certificate of the chief engine r of the French Pacific squadron relative to western coal taken aboard the cruiser Montcalm at Seattle, may be of interest:

By your letter of Aug. 26, you have asked me for information concerning the coal furnished us at Seattle.

The results obtained have been quite satisfactory. Our observations of the coal while it was used on board were as follows:

The coal taken on at Seattle contained a considerable proportion of fine coal, in the neighborhood of 40 per cent. It is a bituminous coal, does not coke on the grate, and would be improved by being mixed with coking coal like the coals of the east—Pocahontas, Cumberland, New River, etc. At first it gives off an abundance of smoke, with a long, yellowish flame. It should be burned in a thin fire (4 to 5 in.) with a slightly active draft. It should be fed forward in the furnace a little at a time and the incandescent coal pushed back each time before feeding. The grates should be spread 2/5 in. as a maximum.

The coke is friable and falls easily into the ash pan. If too much of it should work through, the coal cinders ought to be sifted. There is very little scoria which sticks to the grate and there is very little soot.

Taking Pocahontas for purposes of comparison, this coal can be given a value of 0.9 under conditions where the rate of consumption does not exceed 20 lb. per sq. ft. per hour. Yours, etc.,

A. LE LAY.

Manzanillo, Sept. 3, 1910.

Assistant Secretary Winthrop, when confronted with the experience of Pacific mail liners and other commercial ships, said that the satisfactory service obtained with western coal in the merchant marine was no evidence that it was suitable in ships of war. It was pointed out that the British Pacific fleet used western coal for cruising purposes, just as suggested for our own, and now comes the evidence of still another navy. We stated then

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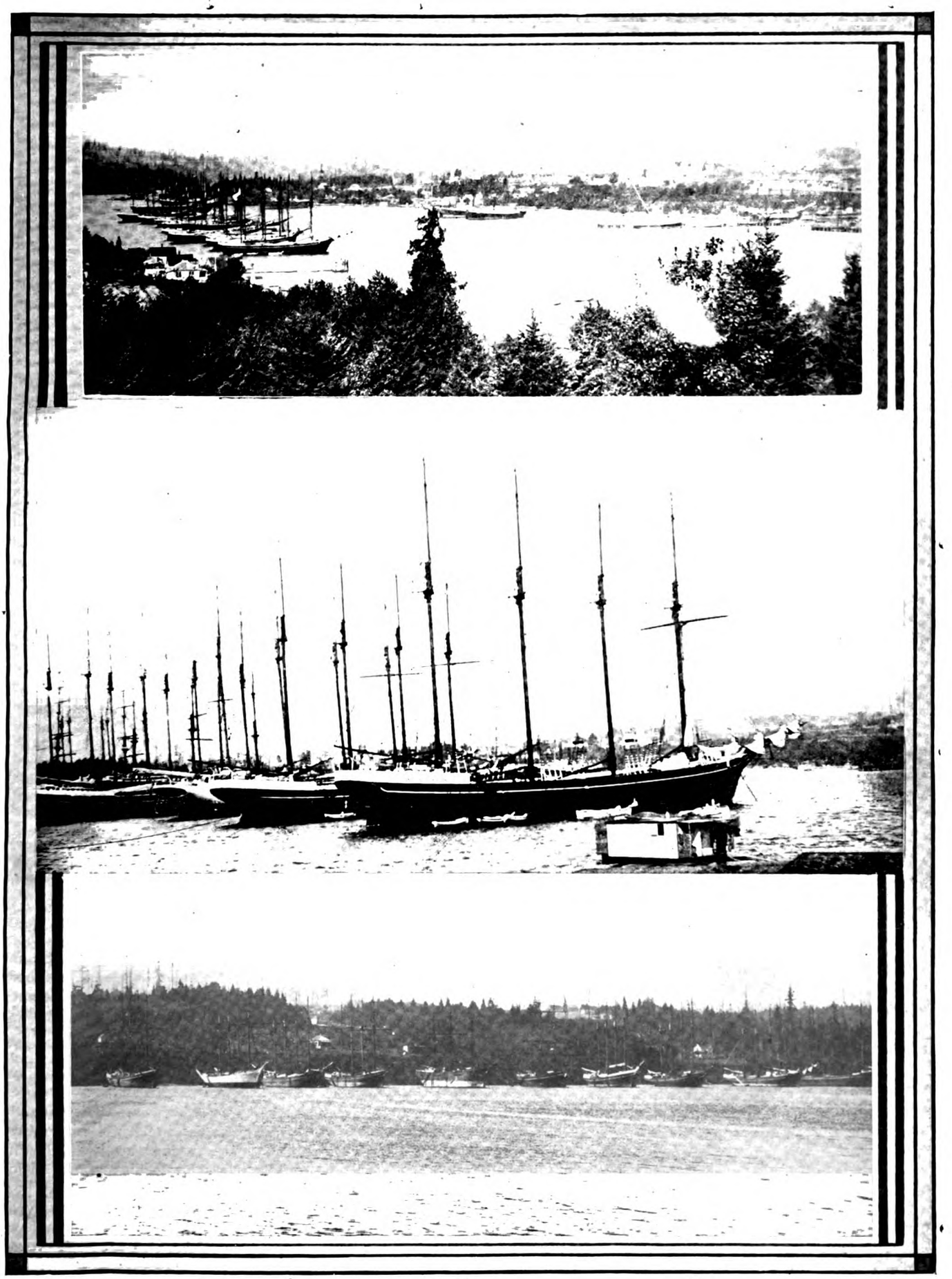

THESE PICTURES SHOW WHAT HAPPENS TO AMERICAN SHIPS WHEN THE GOVERNMENT OF THE UNITED STATES VIOLATES ITS OWN COASTWISE LAWS.

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that the tests conducted by the Geological Survey showed that Pocahontas was only 6 per cent higher in efficiency, and the service tests in the French cruiser reported above agree with the Survey reports very closely.

Obituary

Frederick Meriam Wheeler died at his summer home, Westhampton, Long Island, of heart disease, on Sept. 15. Mr. Wheeler was born in Brooklyn, N. Y. His father, John Wheeler, a native of England, married Jane Meriam, of Brooklyn, a direct descendant of Joseph Meriam, who came to America on the ship Castle in 1638 and settled in Concord, Mass. Mr. Wheeler was graduated at Summit Academy, N. J., and subsequently attended the Polytechnic Institute at Brooklyn. He studied mechanical engineering for four years under Henry J. Davison, of New York. He afterwards took up hydraulic and marine engineering as a specialty and for over 34 years was associated with the George F. Blake Mfg. Co. He was a director and secretary of the company and later a director of the International Steam Pump Works, which absorbed the Blake company.

Mr. Wheeler was the inventor of the Wheeler patent surface condenser. He organized the Wheeler Condenser & Engineering Works, whose plant is located at Carteret, N. J. He was also connected with the Ludlow Valve Mfg. Co. He was one of the charter members of the American Society of Mechanical Engineers and the Society of Naval Architects and Marine Engineers. He was also a member of the American Society of Naval Engineers and the Engineers' Club. He served as a member of the advisory council of the Engineering Congress at the Columbian Exposition.

In 1876 he married Florence Wilmer, of Montclair, N. J. Mr. Wheeler was prominent in social circles in Montclair for many years. He is survived by a widow, two daughters and two sons.

Trial of Torpedo Destroyer Sergipe

The official speed trial of the torpedo boat destroyer Sergipe, built for the Brazilian government by Messrs. Yarrow & Co., Ltd., of Glasgow, took place last month on the Skelmorlie deep water measured mile at the mouth of the Clyde, and the contract speed of 27 knots carrying a load of 100 tons was easily exceeded. The actual speed obtained was 27.676 knots on the mile, and 27.605 knots during a continuous run of three hours' duration.

The trial was under the supervision of Capt. Amynthas Jose Jorgo, Capt. Ribeiro da Costa, Capt. Alvaro Rosauro de Almeida, Lieut. A. Marques and Lieut. A. F. da Rocha, representing the Brazilian naval commission.

The Sergipe is the last of the ten destroyers ordered by the Brazilian government from Messrs. Yarrow. The first seven vessels are now in commission in Brazil, the eighth has just left the Clyde, and the ninth has been handed over to the Brazilian authorities and will shortly leave for Rio.

The dimensions of the Brazilian destroyers are: Length, 240 ft.; beam, 23 ft. 6 in. They are propelled by two sets of four-cylinder reciprocating engines 8,000 H. P. collectively, balanced on the Yarrow, Schlick and Tweedy system. Steam is supplied by two double-ended Yarrow boilers of the latest type.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Building at.	1910: Per cent of Completion. Aug. 1.	Sept. 1.
BATTLESHIPS.			
Florida	Navy Yard, New York	71.0	74.2
Utah	New York S. B. Co.	83.2	85.5
Wyoming	Wm. Cramp & Sons	32.3	35.5
Arkansas	New York S. B. Co.	39.5	43.9
TORPEDO BOAT DESTROYERS.			
Paulding	Bath Iron Works	93.4	98.9
Drayton	Bath Iron Works	88.1	91.7
Roe	Newport News S. B. Co.	97.1	99.3
Terry	Newport News S. B. Co.	91.5	93.5
Perkins	Fore River S. B. Co.	92.3	93.8
Sterett	Fore River S. B. Co.	88.4	89.8
McCall	New York S. B. Co.	89.6	95.5
Burrows	New York S. B. Co.	87.5	92.7
Warrington	Wm. Cramp & Sons	79.5	81.4
Mayrant	Wm. Cramp & Sons	80.8	82.0
Monaghan	Newport News S. B. Co.	28.4	31.3
Trippe	Bath Iron Works	56.7	62.6
Walke	Fore River S. B. Co.	47.6	52.8
Ammen	New York S. B. Co.	56.3	65.4
Patterson	Wm. Cramp & Sons	40.7	44.6
SUBMARINE TORPEDO BOATS.			
Salmon	Fore River S. B. Co.	97.8	98.4
Carp	Union Iron Works	60.0	62.0
Barracuda	Union Iron Works	60.0	62.7
Pickerel	The Moran Co.	56.8	58.1
Skate	The Moran Co.	56.8	58.1
Skipjack	Fore River S. B. Co.	48.6	54.0
Sturgeon	Fore River S. B. Co.	46.2	52.5
Thrasher	Wm. Cramp & Sons	7.9	10.8
Tuna	Newport News S. B. Co.	29.9	31.8
Seal	Newport News S. B. Co.	52.2	54.4
COLLIERS.			
Cyclops	Wm. Cramp & Sons	84.3	89.9
Neptune	Maryland Steel Co.	37.9	43.2

Ask for Bonus

The Canadian government has been asked to give an annual bonus of $250,000 for fifty years for the construction of a dry dock and ship repair plant at St, John, N. B., and a dry dock and ship building plant at Levis, Que. The companies making the application are Harland & Wolff, Belfast, Ireland, McArthur & Perks, who built the Manchester ship canal, the Canadian-Pacific, Allan, Dominion, Manchester and White Star lines. So many of the big liners are now conducting a regular service to Canada that the question of adequate dry dock facilities has become an urgent one. The sum mentioned for the construction of the Levis yard is $3,750,000.

The oil-burning, turbine-driven torpedo boat destroyer Terry, built by the Newport News Ship Building & Dry Dock Co., Newport News, Va., developed 32.188 knots an hour on her standardization trials over the measured mile off Lewis, Del.

The new steamer Verona, built by Martinolict Bros., Dockton, Wash., to run between Tacoma and Quartermaster harbor, is equipped with Seabury engines furnished by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, New York. Her water-tube boilers are supplied by the Taylor Water Tube Boiler Co., of Detroit. The steamer is 124 ft. long, 22 ft. beam, and 7.7 ft. deep.

Under an agreement participated in by owners of vessels in France, Germany, Norway and England, all craft not having their loading marks plainly on the side midway between bow and stern by Nov. 1 will be subject to fine. Circulars to that effect have been received by consuls of the countries concerned to whom complaints of non-compliance are to be made. The rule does not apply to American vessels.

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A ONE HUNDRED-TON FLOATING CRANE

By Walter G. Stephan.[1]

THE operation of a crane, whether it be an ordinary hand crane, an electric overhead traveling crane or a locomotive crane, is always interesting. Possibly it is the great utility of this class of machines which makes them so fascinating to us, or perhaps it is the perfection and simplicity of their mechanism which gives them their charm. Certainly, cranes now perform much of the work formerly done by the main strength of many hands. One of the most interesting recent developments in crane construction is the 100-ton floating crane just completed for the Bremerton navy yard at Puget sound, Wash. It is the most interesting because it is believed to be the largest crane of its kind in the world, the next in size being the crane "Hercules," which was built to lift 100 short tons, while the crane which is the subject of this article is designed for 100 gross tons.

The designer of a machine to be used on land can usually depend upon a solid foundation for support, but the designer and builder of this monster marine crane, the Wellman-Seaver-Morgan Co., Cleveland, was confronted with a very complex problem, which involved questions of stability, with its related problems of center of gravity, metacenter, draught and maximum allowable inclination. The recent elaborate tests made by the government engineers have proven conclusively that the crane is exceptionally stable and capable of handling more than the specified loads. The loads accompanying photograph gives a good idea of the construction of the main framework and will illustrate the uses to which the crane is to be put. It is shown in position ready to unload part of the machinery of the cruiser Washington.

The government specifications called for a structure to be mounted upon a floating pontoon, and intended for lifting and moving guns, turrets, armor plates, boilers and other materials to and from cars, wharves and ships at the Puget sound navy yard at Bremerton. It must possess in a high degree safety, stability and ease of manipulation.

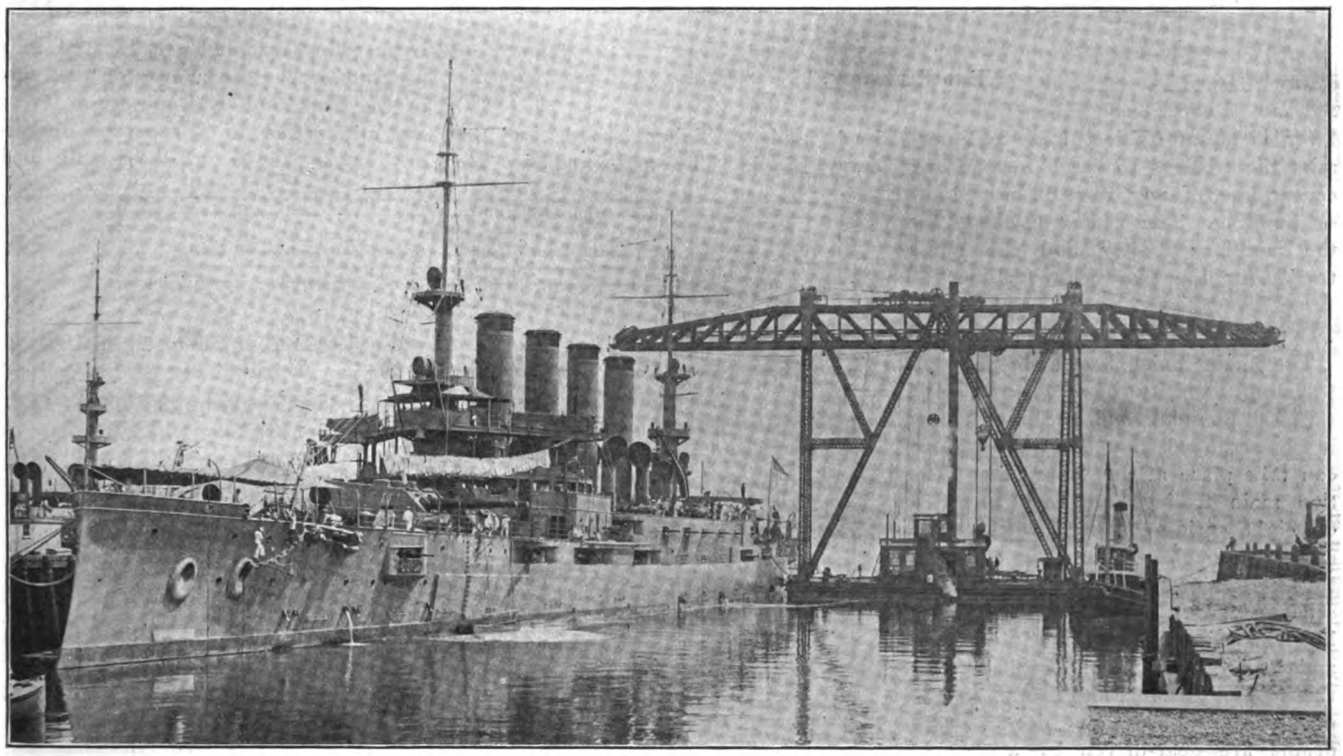
[1]Cleveland.

The Pontoon.

The pontoon which supports the main frame is built entirely of open-hearth steel, and it is provided with fenders, guards, mooring bitts, cleats and all other attachments necessary for convenient and successful operation. It is approximately 100 feet long and 60 feet wide, and is divided into six water-tight compartments by bulkheads extending full length and width. Four single barrel reversible steam capstans made by the American Ship Windlass Co. are provided for maneuvering.

It was specified that the crane must have a freeboard of not less than 3½ feet when lifting the maximum load, and in addition must have a capacity in excess of these loads of 300 gross tons deck load, with a freeboard for the combined loads of not less than 2 feet, conditions which of course called for the most careful calculations on the part of the engineers.

The main frame is of structural steel and consists of two A frames, with bracing, supporting three independent trolley tracks each about 220 feet long, carried at a height of about 80 feet above the deck. Each canti-



Floating Crane in Working Position Alongside Cruiser Washington.

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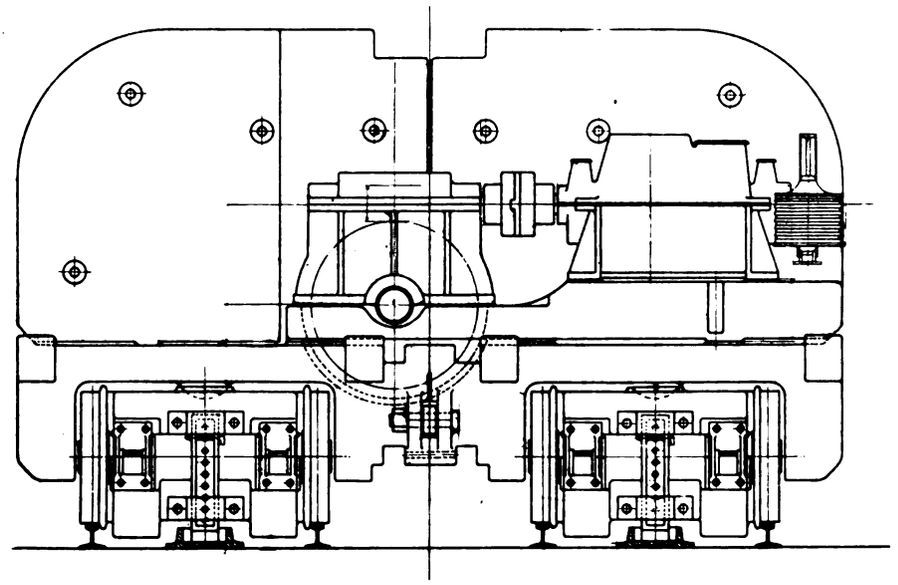


END ELEVATION.

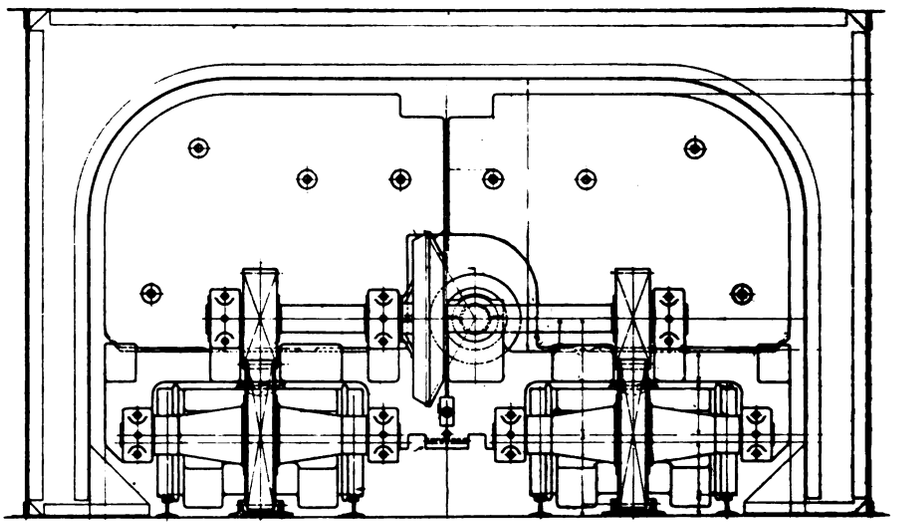
lever is about 65 feet long and permits the trolleys to reach beyond the center line of any warship now built or building. The center track is for the auxiliary trolley and the outer tracks for the two main trolleys.

The Main Hoist.

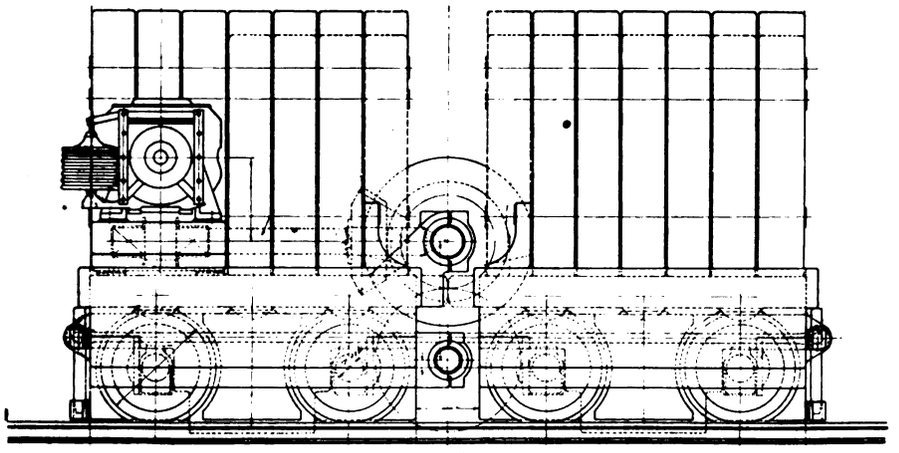
The main hoist has a lifting and traveling capacity of 100 gross tons (224,000 pounds) and the mechanism is so arranged that both operations can take place at the same time. The two main trolleys are each mounted on eight spring-equalized wheels, and each is capable of handling 50 gross tons. The trolleys can be handled separately or together as desired. The hoist cables are of 1⅜-inch plow steel and lead over a series of sheaves to the two main hoisting drums in the machinery house on deck. These drums are gear-driven by a pair of 12 x 15-inch hoisting engines through two separate sets of gearing, giving a low speed for lifting the maximum load, and a higher speed for the empty hook. The main trolleys are traversed by a pair of 10 x 12-inch reversing engines, geared to a 60-inch drum, so that this operation is independent of the hoisting motion. The specified hoisting speed of the main hoist with a full load was a minimum of 7 feet per minute with a trolley travel speed of not less than 100 feet per minute. Without load the speed of the hook was to be not less than 100 feet per minute.

The Auxiliary Hoist.

The auxiliary hoist has a capacity of 15 gross tons (33,600 pounds) and is operated from a single four-wheel trolley traveling on the center track. Its cables lead to separate hoisting and traveling drums similar to those of the main hoist. The operations of hoisting and traversing can be carried on simultaneously. The auxiliary trolley machinery is located in a separate steel frame house on one side of the deck, and the operating levers are all carried to a separate operator's house above it. With full load the specifications called for a hoist speed of not less than 50 feet per minute and a trolley travel speed of not less than 200 feet per minute. The hoist speed with empty hook was to be not less than 100 feet per minute.



CROSS SECTION AT CENTER.



SIDE ELEVATION.

The Power Plant.

Steam at 150 pounds is supplied to the hoisting and trolleying engines, the pumps, generator set and the steam windlasses by two 60-horsepower marine type boilers. For supplying current for the electric motor on the counterweight and also for the electric lights, a Shepherd vertical high-speed engine is provided, direct connected to an 87-kilowatt Westinghouse 250-volt generator. This equipment makes night operation practica-

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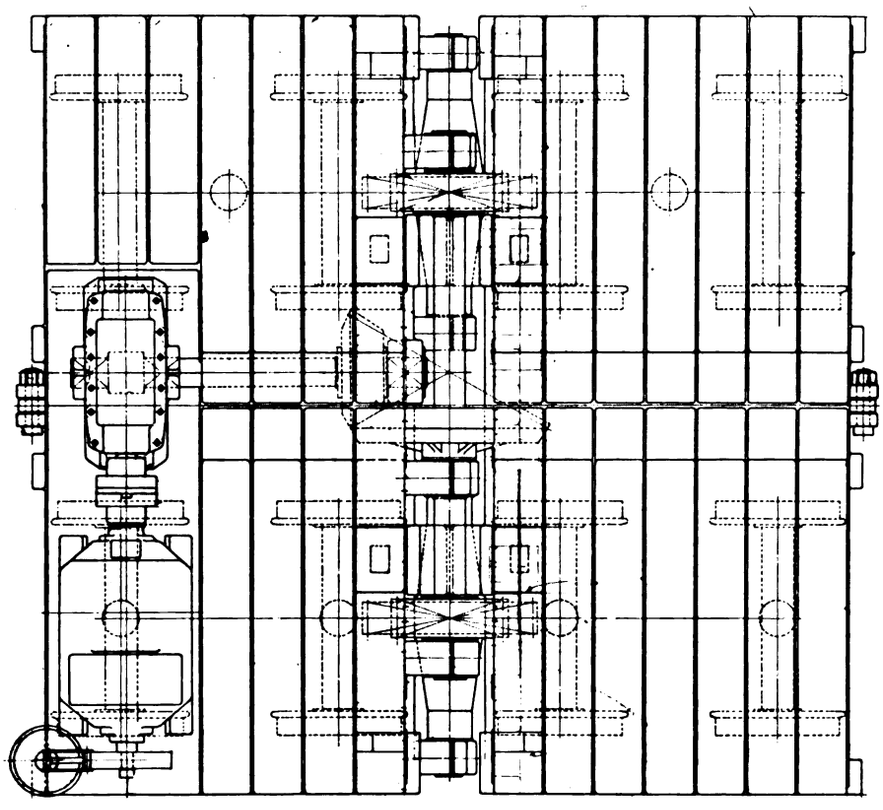

PLAN OF COUNTERWEIGHT CAR.

ble, as the machine is liberally provided with electric lights.

An electrically-driven centrifugal pump is located in the machinery house, for pumping out the watertight compartments, and stairways, with water-tight hatches, are fitted for convenient access to the hold. At one end of the machinery house is a neatly appointed office for the use of the officer in charge.

The Automatic Counterweight.

By far the most interesting and unique feature of this machine, however, is the automatic counterweight, which consists of a series of heavy castings bolted together, two of which are so formed as to make truck castings to support the axle bearings. This counterweight car (weighing about 600,000 pounds) travels on double tracks laid lengthwise through the center line of the floor of the hull. The line engravings show end and side elevations and plan of this device. This counterweight is necessary in order to prevent the machine from listing more than the specified limit of 3 per cent in either direction. On top of the car is mounted a 100-horsepower Westinghouse mill-type series wound motor which drives, through a worm and worm wheel, a pinion which meshes with a rack lying between the rails on which the counterweight runs. In order to stop the weight immediately when desired a solenoid post brake is provided, which releases the brake when current is applied and sets it when the current is interrupted.

The current for the motor is regulated by a controller mounted right on the counterweight. This consists of a number of magnetically operated switches and an automatic device for limiting the starting current of the motor. To start the motor in a given direction it is only necessary to supply a small magnetizing current to the solenoids which operate a group of magnetic switches which then close in proper rotation until full voltage is applied to the motor. Current is collected from two contact bars, by means of sliding shoes mounted upon the counterweight.

The current for operating the controller switches is applied by a pendulum-operated switch which swings in a plane parallel to the bridge and counterweight track. This is the ingenious feature of the counterweighting apparatus. When the load has given the bridge a predetermined list, the pendulum closes a contact on that side which supplies current to the proper group of controller switches, which, in turn, set the motor armature in motion in the proper direction to counterbalance the load. When the position of the load is altered so that the machine is listed in the opposite direction, the pendulum swings in the opposite direction, closing another contact which supplies current to the other group of switches and brings the counterweight back until the pendulum again swings free. To provide against overtravel, a limit switch is provided, to stop the motor automatically at each end of its runway. A manually operated controller is also fitted, so that the counterweight can be operated by hand when desired. This electric automatic counterweight system has proven very satisfactory, and has been patented by the Wellman-Seaver-Morgan Co. An interesting feature in connection with its operation is the unusual use which has been made of it. When it is desired to take a lift very slowly, the hitch is made and a strain taken on the cables. Then the counterweight is moved gradually up the incline, increasing the strain on the cable and thus carefully lift the load. The nicety with which this can be done is very interesting to observe.

The crane was recently tested for acceptance by the government engineers and more than fulfilled the specifications. The test load for the main hoist consisted of pieces of armor plate weighing almost 243,000 pounds, which was handled very easily by the hoisting engines, although it is about 8 per cent in excess of the specified load. The test load for the auxiliary hoist was over 39,000 pounds, about 16 per cent in excess of requirements.

A Large Floating Shear Leg

Herewith will be found an interesting example of another type of hoist of equal capacity, which is usually found as an item of shore equipment. This has been installed by the Vulcan Co. in its new shipyard at Hamburg.

The questions of stability involved are considerably greater in the case of the shear leg, because of the great height of the legs, which are 143 feet 7 inches long from center of pivot bearing to the head. The legs have a maximum outfall of 47 feet 5 inches. The arrangement of pontoons is noteworthy. There are two pontoons, that in front upon which the legs are stepped being 92 feet 8 inches long, 36 feet wide and 9 feet deep, and the second, connected to the first by girders, as seen in the illustration, is 74 feet by 29 feet 6 inches by 8 feet 3 inches, the distance between centers being 32 feet 10 inches. The distance between the two pontoons may be varied by means of cable and capstan gear driven by the main engine and

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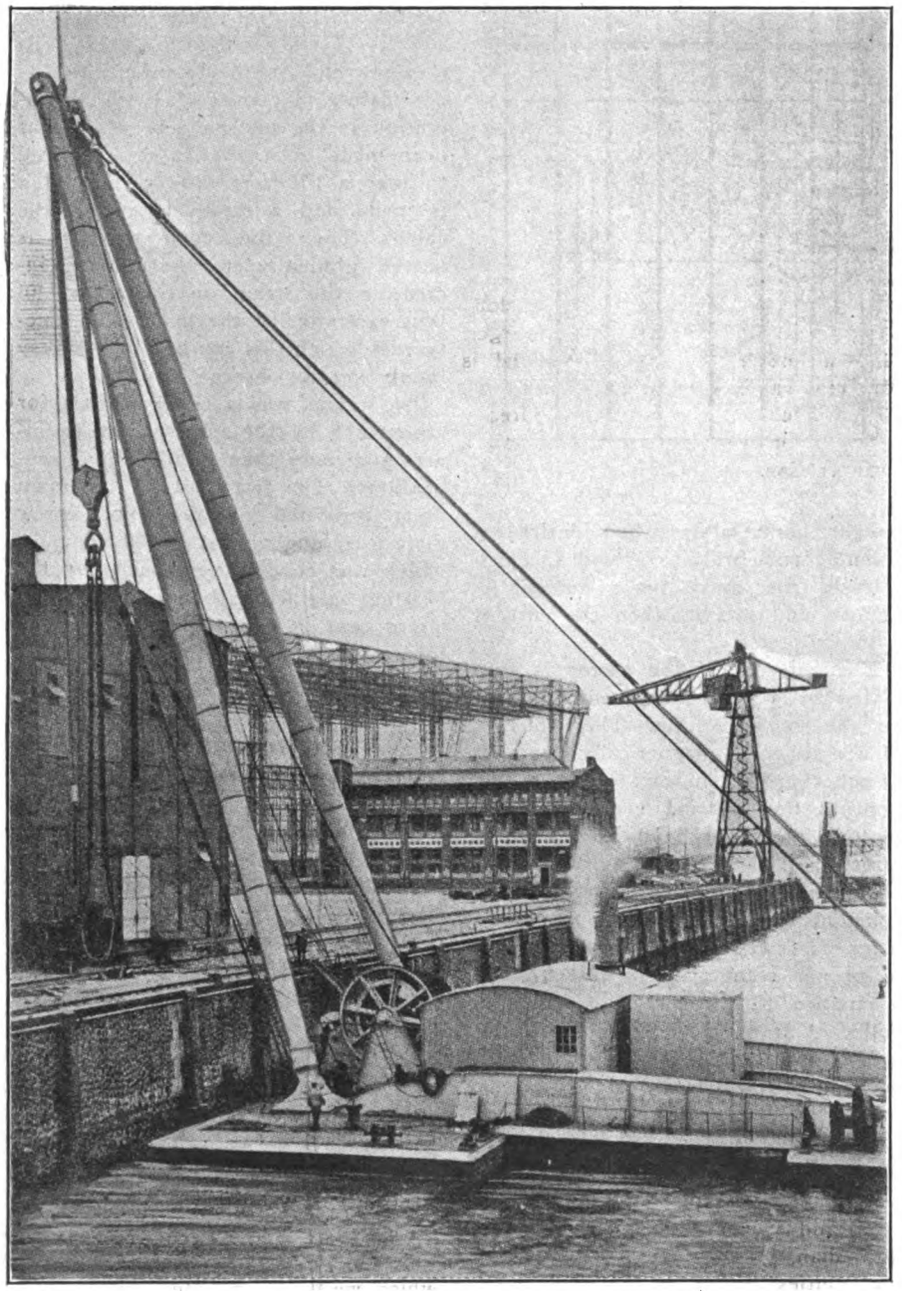
is determined by the overhang of the legs. This has the effect of doing away with shifting ballast. The girders extend across the rear pontoon and the head guys are attached to their extremities. Three sets of falls are provided, of 100-ton, 20-ton and 5-ton capacity, respectively. The Vulcan Co. has already at its yard at Stettin two floating shears of 100-ton and 50-ton capacity, and that they have been satisfactory is evident by the addition of this third unit at the new yard.

In the fitting out of large ships under a stationary leg the ship has to be continually shifted in order to bring the point of deposit fairly under the head of the shears, and with the large ships for which the new yard is specially fitted, this shifting involves much time and labor. In the background will be seen a type of crane which has come into considerable favor in recent years for fitting out docks, namely, the tower crane, which not only has a movement parallel with the face of the wharf but has a range of the entire circle covered by the cantilever arm.

Other examples of large floating cranes of still greater capacity are to be found at Harland & Wolff's shipyard, Belfast, Ireland, and at Krupp's, Kiel, Germany. Both of these are of the same type and capacity, namely, 150 tons. In size, however, these cranes completely dwarf those previously described. The cranes are of the lift jib type, the jib being pivoted at the top of a revolving tower. The peak of the jib in its highest position is 245 feet above the deck of the pontoon. The working radius with full load is 98 feet 6 inches; with 110 tons, 131 feet; and with 35 tons, 148 feet. A test load of 200 tons was applied at the normal full load radius, 98 feet 6 inches. The least radius of the peak of the jib, from which the 150-ton fall is hung, is 32 feet 10 inches. There are, in addition, two auxiliary trolleys of 35 and 10 tons capacity respectively, which travel along the lower flange of the jib. Two motors with a total horsepower of 135 are provided for the 150-ton fall, one 90-horsepower motor for the 35-ton trolley and one of 55 horsepower for the 10-ton trolley. Two 17-horsepower motors operate the turning gear, effecting a complete turn in 6½ minutes. The pontoon, which is self-propelling, has a length of 131 feet, a width of 85 feet 4 inches and a depth of 14 feet 9 inches. The crane tower is located on the center line of the pontoon. The greatest angle of heel of the pontoon with maximum load at maximum radius is stated to be between 5 and 6 degrees.



ONE HUNDRED-TON FLOATING SHEAR LEG AT VULCAN CO.'S YARD, HAMBURG.

New Steamer for Merchants' Transportation Co.

Manager F. H. Marvin, of the Merchants' Transportation Co., Tacoma, has placed a contract for the construction of a single screw, passenger boat for the Tacoma-Olympia run with Martinolich Bros., Dockton, Wash. The new boat will be named Nisqually, and will be 135 ft. long, 22 ft. beam and 8 ft. draught. She will be fitted for oil fuel, and powered with an 850-H. P., triple-expansion engine. She will have accommodations for 450 day passengers. Her specifications call for a speed of 17 knots, to enable her to make three round trips daily between Olympia and Tacoma. The main cabin will be 85 ft. long by 16 ft. wide, with an observatory plate glass front and wide promenade on either side and an open deck aft. The Nisqually will be ready for operation next spring. The contract for her machinery has been awarded to the Great Lakes Engineering Works, Detroit.

Martinolich Bros. have also recently completed for C. E. Wiman, Dockton, a single screw, day passenger vessel for service between Tacoma and Quartermaster Harbor. The new boat, Verona, is 124 ft. long, 22 ft. beam, and has accommodations for 300 day passengers, and is said to have a speed of 17 knots.

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ATLANTIC DEEPER WATERWAYS ASSOCIATION

THE convention of the Atlantic Deeper Waterways Association held at Providence, R. I., in September, was very widely attended and it was estimated that altogether in the harbor there were a thousand craft of various kinds. Briefly, the purpose of the convention was to promote the building of an inland waterway from New England to Florida. Gov. Aram J. Pothier, of Rhode Island, welcomed the delegates on behalf of the state. The response on behalf of the north was delivered by Congressman W. S. Greene, of Massachusetts, who declared that the construction of a waterway inside the dangerous shoals and currents of the Atlantic coast was far more valuable to the business interests of the United States than the construction of the Panama canal.

Congressman John H. Small, of North Carolina, responded on behalf of the south. He said that the coast line of the South Atlantic and Gulf states extends a distance of 3,007 miles, while the coast line of the North Atlantic states is 888, and that of the Pacific States 1,557 miles. He pointed out that the commerce of the southern ports is growing very fast, and that Galveston today holds the position of second in value of exports. He declared the wealth of the south to be six billion more than the total wealth of the whole country in 1860. There is only one obstacle, he declared, in the way of mutual progress, and that is the lack of an intra-coastal waterway. A protected water route from Boston to Florida would forever emancipate commerce from the terrors of Cape Cod and Hatteras.

President Moore's Address.

President J. Hampton Moore, in his annual address to the association, said: "The formation of the Atlantic Association was notice not only to the west, but to the east and to the government as well, that we too, upon the Atlantic seaboard, had goods to ship and contracts to keep; that we, too, had swamp lands to drain and farms to irrigate, and timber lands to protect; that more than this, we had crops to be carried to the consumer, crops from Florida, for instance, that were as distant from the market and as worthy of sale and transportation as those of the great northwest; that we, too, had great transportation problems and fewer railroads than our competitors; that we, too, desired an outlet by water for our farmers and merchants and manufacturers if we could not get it by rail. In short, it was a notice that we had something along the Atlantic seaboard to fight for."

Rear Admiral C. S. Sperry also made a brief address, saying among other things:

"The great systems of canal and river transport which center in New York demand a secure outlet to the eastward by way of Long Island sound for their heavily-laden barges, and, although the Cape Cod canal is of great value, it is still very desirable to provide such a canal as has already been advocated before the Association in order that such craft may avoid the stormy seas of Point Judith and proceed in safety to Massachusetts bay, distributing the benefit of their transport to the great industrial towns of the interior as well. The inland waterways of the Atlantic coast not only provide security for our great coasting trade from the perils of the sea and war, but they also afford the highway for the patrol of the coast by torpedo boats and submarines."

Addresses were also made by Commander Alfred Brooks Fry, chief engineer in the United States Treasury Service, who spoke on the subject, "Commercial Canals and Lock to Carry Barges of 600, 1,000 and 2,000 tons Capacity." Herbert Knox Smith, commissioner of corporations, spoke on the subject of "Port Terminals."

Congressman Goulding, of New York, read a paper prepared by Calvin Tompkins, commissioner of the Department of Docks and Ferries, on the subject, "Terminal Facilities Required for the Successful Co-ordination of Rail and Water Traffic." He thought Canadian, European and South American cities were making greater advances in terminal facilities than American cities.

O. P. Austin, chief of the Bureau of Statistics, Department of Commerce and Labor, spoke on the subject, "Atlantic Seaboard Commerce, Inland and Coastwise." Gov. Frank B. Weeks, of Connecticut, spoke upon "Connecticut's Water-borne Commerce."

Resolutions Adopted.

The association adopted resolutions as follows:

"The Atlantic Deep Waterways Association, in convention assembled in Providence, R. I., August, 1910, speaking directly for a constituency of more than 30,000,000 American citizens dwelling and doing business upon the Atlantic seaboard, presents to the American people generally the following statement of its purposes and of the facts upon which its cause and its demands are based.

"First—The aim is to cut deep waterways through about 70 miles of obstructive necks of land, along a line plainly indicated by nature and perfectly practicable, so that, fairly parallel with the coast, an inland channel shall be created approximately 1,500 miles in length, reaching from Boston harbor to and including Florida and ultimately having extension to the Gulf and to New Orleans.

"Second.—This proposed channel will lie along a coast on which are situated the big front doors from the Atlantic to the entire country, and it will be tributary not only to all the many minor but important ports of the nation on that coast, but to the four great cities, Boston, New York, Philadelphia and Baltimore, the customs receipts of which are four-fifths of all the revenue of the government from the tariff.

"Third.—Thus the proposed enterprise cannot be regarded as sectional in its character. It is, indeed, certain to be productive of important and profitable commercial consequences to all the states affected by the influence of transportation rates east of the Rocky mountains. We heartily favor all projects approved by the United States engineers for the improvement of inland waterways in the Mississippi valley and far west, but, lest these should appear to have importance much superior to that of the enterprise to which we are committed, we point to the fact that the entire tonnage of the Mississippi and Missouri rivers in the year 1907 was not much more than that of the single port of Providence, R. I.

"Fourth.—We demand the construction at an early date of the deep waterway along the Atlantic coast as a measure imperatively required to prevent the strangulation of the trans-

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portation business of the millions of people affected by the seaboard commerce. Railroad expansion clearly cannot meet, in any length of time, the swift-growing requirements of American business; at the best railroad expansion, no matter what time may be given, is necessarily limited, while the possibilities of expansion upon waterways, properly constructed, are practically without limitation. It is clear to us that it must be greatly to the public advantage that the demands of the prospective certain growth of commerce shall be anticipated rather than that they shall be disregarded until the choking of the channels of trade and the semi-paralysis of business shall make remedial measures compulsory after heavy losses have been inflicted. The time for action is now. Prevention of congestion, not delay until there must be relief from congestion, is what we aim at.

"Fifth.—The American people, producers, business men and the great body of consumers, are entitled to the lower costs and the savings which always ensue upon resort, upon a large scale, to a water transportation. That cost is rarely half, and often very much less than half, of the movement of commodities by rail; and besides, removal to inland and perfectly safe channels of much of the coastwise carrying trade now forced upon the sea will mean large saving of insurance, of time, of loss of property, of money and of human life.

Appeal to New England.

"Sixth.—We appeal strongly to New England to stand by and actively to promote this great enterprise. Surely that important part of our country needs, in a particular degree, emancipation from almost complete dependence upon railroads. Taking in every year 24,000,000 tons of coal and sending out $2,000,000,000 worth of her manufactures, New England has requirements for the economical movement of commodities which should enlist her public sentiment and the efforts of all her public men in the active promotion of the Atlantic deeper waterways.

"Seventh.—This undertaking has the peculiar fortune that no important interest is openly arrayed against it, and no noteworthy argument for its abandonment has ever been presented from any source. The case is and always has been one-sided, and in the continued absence of a negative the affirmative would, in our judgment, have won its case long ago but for the apathy of the people who have not yet learned in what direction their best interests lie.

"Eighth.—Upon the communities verging on the proposed Atlantic coast inland waterways we urge strongly the necessity that there shall be early preparation for enlarged commercial operations by the acquirement by the public authorities of water frontage, by the equipment of each port with modern mechanical appliances for movement of freights and by the creation generally of terminal facilities which will be effective for the loading and unloading and the economical handling of commodities.

"Ninth.—We direct attention, in conclusion, to the following facts:

"The Federal government should construct the waterways, because they will be a part of the coast defense in time of war, because the channels should be as free to all comers as are the river channels now controlled by the general government, and because the enterprise is distinctly national and not local.

"If Americans will look at the canal construction already completed and now in process of large extension in the civilized countries of Europe, and even in Canada, they will find an incentive to action, not only from national pride, but from the conviction that, with all our progressiveness, we are being left behind by other peoples.

"Tenth.—It is the recommendation of this association that Congress shall extend the internal waterways survey to and including the coast of Maine.

Resolved, That this association make grateful acknowledgement and extend most cordial thanks to the State of Rhode Island, through her distinguished governor and legislature to the city of Providence, through his honor the mayor and municipal council, to the Providence Board of Trade, to the several committees and all the citizens of the state and city for the genuine welcome, the complete and systematic arrangements and the lavish hospitality provided for the delegates to the third annual meeting of the association."

Steamer Currier

THE steamer Currier was launched from the yard of the Fore River Ship Building Co., Quincy, Mass., on Sept. 20, being christened by Miss Anne Currier, daughter of Guy Currier, of Boston, for whom the vessel is named. The Currier will be ready for her maiden trip to Havana in November. She is building for the Cuba Distilling Co.

The Currier is a single screw steamer constructed of steel to the highest class in Lloyd's register and specially designed to be operated in either the molasses, bulk petroleum or general freight trades, a combination rarely met with in cargo vessels. The principal dimensions are 370 ft. by 52 ft. beam, and operating on a draught of 22 ft. 6 in., the vessel will carry 6,500 tons deadweight.

The arrangement of the ship consists in placing the machinery right aft and dividing the dead flat body into five double tanks each bounded by transverse and centerline oil-tight bulkheads. A general cargo hold is fitted forward and aft of these tanks, and the steamer has a continuous inner bottom as far forward and aft as practicable. These tanks may be utilized for the transport of either mollases or bulk petroleum, for which purpose they have a special pumping system installed for either loading or discharging the liquid cargo. The wing spaces at each side of expansion trunk, together with the forward and aft cargo holds, can be used for the carriage of general freight cargoes together with the oil tanks when not operating in the petroleum trade. For this reason the ship has been provided with two steel pole masts, each rigged with four 5-ton derricks for the rapid handling of general merchandise.

The Currier has a long poop, short bridge and top-gallant forecastle, the former of which encloses quarters for the firemen and seamen with a poop deck house arranged with commodious quarters for the engineers. The bridge house is fitted up with cabins, saloon, pantry, etc., for the navigating officers, and has a steel deck house on top specially arranged with a suite of rooms for the captain.

All the latest and most approved auxiliary machinery has been installed comprising a Hyde steam windlass, combined steam and hand steering gear, stem capstan, powerful deck winches, electric light throughout, and the usual pumping, drainage, fire main, sanitary and fresh water system.

The propelling machinery consists of a set of triple-expansion engines supplied with steam by three single ended Scotch boilers, the installation developing sufficient power to propel

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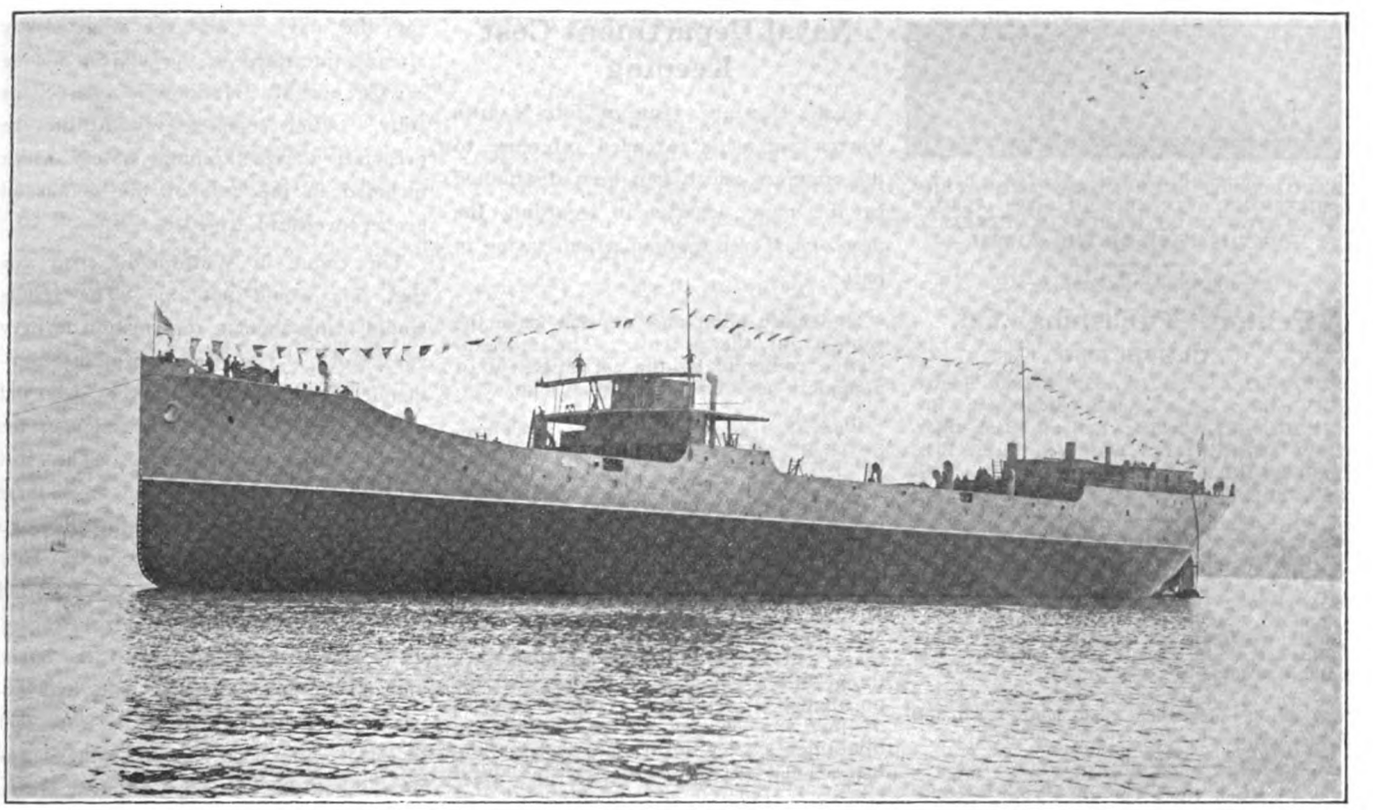

STEAMER CURRIER, OF THE CUBA DISTILLING CO.'S FLEET, TAKEN IMMEDIATELY AFTER HER LAUNCHING FROM THE YARD OF THE FORE RIVER SHIP BUILDING CO., QUINCY, MASS.

the vessel at a mean sea speed of 10 knots per hour.

Altogether the Currier is a notable addition to the American merchant marine and on account of her adaptability to such varied trades as those mentioned should prove a valuable asset to the company operating her.

An Enviable Record

A letter of endorsement recently given by an official of the Isthmian Canal Commission to the operator who had charge of the eight Lidgerwood cableways used in building the Gatun locks during the preceding eleven months contains incidentally a remarkable record of efficiency of the cableways. This passage read as follows:

"These cableways so far as delays from breakage or repairs were concerned, while working 12½ hours per day, have been kept up to an efficiency of 99 per cent."

That is to say, that during this whole period only 1 per cent of time was lost on account of making repairs.

The cableways referred to are eight of the 13 cableways designed and built by the Lidgerwood Mfg. Co. for the Isthmian Canal Commission. The other five are used for handling the broken stone and sand for the concrete, taking it from barges and delivering it to the storage yards some 600 ft. away on the average. The total to be handled will be 2,000,000 cu. yds. of broken stone and 1,000,000 cu. yds. of sand.

The eight cableways for building the locks are used for placing the concrete and reinforcement and also for handling forms.

They are traveling cableways of 800 ft. span, operated electrically. They are handling on every working day more than 3,000 cu. yds. of concrete. Up to June 4, there had been placed in the Gatun locks and its auxiliary plant, 437,461½ cu. yds. of concrete. The amount placed in the five days from May 31 to June 4 inclusive was 16,809 yds., an average of 3,361 cu. yds. per day.

It is understood that the New England Coal & Coke Co., which three years ago began the transportation of its own coal in its own vessels, the Melrose, Malden and Everett, built for it by the Fore River Ship Building Co., is endeavoring to secure the fleet of the Boston Tow Boat Co., and has made an offer of $80 a share for the $1,250,000 worth of outstanding stock of the Tow Boat Co.

SHIP BUILDING IN THE UNITED STATES.

The bureau of navigation reports 376 sail and steam vessels of 95,137 gross tons built in the United States and officially numbered during the quarter ended Sept. 30, 1910, as follows:

	Wood. Sail. No.	Wood. Sail. Gross.	Wood. Steam. No.	Wood. Steam. Gross.	Steel. Steam. No.	Steel. Steam. Gross.	Total. No.	Total. Gross.
Atlantic and Gulf	20	1,565	162	5,854	20	42,796	202	50,215
Porto Rico	..	.....	3	26	..	.....	3	26
Pacific	3	703	60	2,310	2	2,810	65	5,823
Great Lakes	2	55	45	821	17	36,942	64	37,818
Western rivers	..	.....	41	1,243	1	12	42	1,255
Total	25	2,323	311	10,254	40	82,560	376	95,137

During the corresponding quarter ended Sept. 30, 1909, 347 sail and steam vessels of 48,914 gross tons were built in the United States and officially numbered, as follows:

	Wood. Sail. No.	Wood. Sail. Gross.	Wood. Steam. No.	Wood. Steam. Gross.	Steel. Sail. No.	Steel. Sail. Gross.	Steel. Steam. No.	Steel. Steam. Gross.	Total. No.	Total. Gross.
Atlantic and Gulf	34	3,170	115	2,984	1	1,034	14	18,363	164	25,551
Porto Rico	3	17	1	8	..	.....	..	.....	4	25
Pacific	5	1,050	65	2,196	1	32	1	67	72	3,345
Great Lakes	..	.....	46	1,102	..	.....	8	17,327	54	18,429
Western rivers	..	.....	49	1,461	..	.....	2	103	51	1,564
Total	42	4,237	276	7,751	2	1,066	25	35,860	345	48,914

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THE MARINE REVIEW

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Naval Department Cost Keeping

In the December issue of THE MARINE REVIEW we made extended reference to the circulars which had been distributed by the navy department regarding the proposed Meyer reorganization, saying in part:

One more point and we will leave the subject for the present. The reorganization contemplates the establishment of a modern and efficient cost system.

When this system is established at all navy yards, their work can be compared with similar work of outside firms.

THE MARINE REVIEW takes this opportunity to assert that the department will not do and has no intention of doing anything of the kind. There will be no cost system which will give the slightest indication of cost beyond possibly the labor pay roll and material invoices, and there will be no effort to establish anything more complete. There will be no items of overhead expense, salaries of line and bureau officers, interest on investment, taxes, insurance, depreciation, inspection, postage and telegrams, legal expenses, repairs and maintenance, or profit on product, and any so-called cost system, which does not show these charges in comparison with outside firms, with every one of which they are and must be taken into account, is nothing but a swindle and will fool no one but the department.

This was months before the naval appropriation bill was passed and which contained the following provision:

Provided further, That in fixing the cost of work under the various naval appropriations, the direct and indirect charges incident thereto shall be included in such cost.

In the past the cost of work in navy yards has not represented actual costs, as no overhead charges were included. Mr. Newberry, when assistant secretary of the navy, realized the importance of obtaining actual costs. He knew that the cost of work in the navy yards was outrageous and felt that the first step in effecting a remedy was to institute a cost keeping system which would show what the work really cost. This would enable comparisons to be made with the cost of work in commercial establishments and would show the navy yard costs to be far greater. With an accurate cost keeping system he would be in a position to force improved methods in the navy yards. He directed the paymaster-general of the navy, Admiral Rogers, to detail two officers to visit all of the best conducted commercial establishments to learn their methods and to prepare a cost keeping system for the navy. Admiral Rogers was already interested in the subject and he carried out Mr. Newberry's instructions fully. After complete investigation he prepared a cost keeping system which included in the cost of the output all proper overhead expenses.

The clique in Washington soon saw that this would not do. The results would bring about a reformation in navy yard work. The useless captains, commanders and other line officers, who did not add one iota to the efficiency of the plant would have to go. The soft shore berths would be taken from these officers and they would be forced to go to sea. This would never do. They set about to undo the good work started by Mr. Newberry and Admiral Rogers. They forced the retirement of the latter, and all of his assistants who had experience in this line of work were sent to sea. The cost keeping system was then taken in hand by Admiral Swift, the former aide for material. Very soon all the good work done by the paymaster-general was undone. The cost keeping instructions became a mass of contradictory orders. An order was issued one day to be revoked a few days later. Costs of any kind were impossible.

Certain members of the naval committee learned that it was the intention of Secretary Meyer and his aides not to include overhead charges in the navy yard costs. These members are interested in reforming navy yards. Congress is requiring private contractors to conform to the eight-hour day and at last the navy yards and the private contractors were to be on the same basis as regards hours of work. These members desired that a comparison should be made between the cost of work in the private yards and the government yards and to enable such a comparison to be made the provision was made in the naval appropriation bill that all indirect costs should be included.

Let us see how Secretary Meyer and his so-called "aides" are carrying out this law. THE MARINE REVIEW has secured a copy of the instructions for cost keeping issued June 21, 1910, by direction of the secretary of the navy.

This is a remarkable document in many ways. It displays everywhere ig-

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norance of the subject and violates the very elements of accurate cost keeping. Perhaps, however, the most remarkable feature of this order is that the secretary of the navy confesses that he has no intention of obtaining the *actual cost* of the work in navy yards. This confession appears in one of the opening paragraphs of the order and is as follows:

> By the introduction of this system it is not the intention to obtain the actual cost of work from a commercial standpoint, but to more accurately distribute the expenditures to the proper appropriations as defined by law.
>
> For the purpose of obtaining the industrial cost of production it is essential to eliminate therefrom all expenditures of a military nature at navy yards. With this end in view, the following headings will be used for military expenditures:
>
> "Cost of Valuation" and "Maintenance and Repairs."

The law, as quoted above, requires that the costs of navy yard work shall include the indirect costs. Mr. Meyer is not carrying out these mandatory requirements of Congress. The law does not empower the secretary, his aides, or even the president, to make any classification of expenses as military or otherwise. The device is invented as a screen to protect the incompetents and place hunters. We give below a few of the more important indirect costs that are *not* included in the cost of work according to Mr. Meyer's "system."

1. Officers' salaries.—At all yards there are now a large number of officers and at the large yards the salaries of officers amount to from $130,000 to $200,000 a year.
2. The cost of clerical work.
3. The cost of draftsmen.
4. The cost of civilian assistants, subinspectors, expert aides, chemists, watchmen, messengers, etc.
5. Leave and holiday. Besides the usual holidays, 15 days' leave is granted to all employes who have worked a year.
6. Payments made on account of death or disability of employes.
7. Expense of receiving, testing and handling stores. No store-hand expense is charged.
8. Depreciation of plant.
9. Fire insurance.
10. Interest on money invested.
11. Taxes.
12. Repairs made to buildings, railways or plant machinery when such repairs exceed $100.
13. Cost of inspection department.

What explanation can be offered for not including these expenses in the cost of work? The navy department surely will not venture to contend that these are not indirect costs, in view of the universal practice to so consider them.

There is but one reason for excluding these expenses from the cost of work and this reason is that the *navy department does not dare let the country know the actual cost of work in the navy yards.* If the real costs are ever known, the downfall of the present system of naval administration is as certain as death.

The cost keeping instructions themselves are ludicrous. We have not space to comment on these, but we advise our readers to obtain a copy and see for themselves how the accounts of the millions spent by the navy are kept.

For example, repairs to buildings, plant, etc., which cost less than $100 are charged to the expense account, while if over $100 are not charged to the account. If it is desired that the expense accounts be high, the work is divided into a large number of small items, each less than $100, while if it is desired that the overhead charges be low, these items are bunched in one large item and charged elsewhere. This juggling of accounts is going on in every navy yard and will be recognized by those who have had dealings with government departments as another phase of the system of evasion followed in certain departmental transactions. Practically all branches of the service operate under a law which requires that all work costing over a certain figure must be advertised and let to the lowest responsible bidder and the way it is evaded is by cutting up a job into the necessary number of units or sections, each of which will come within the legal limit. In this way almost any job, especially repairs, can be placed wherever desired.

The labor for handling stores is charged to one naval appropriation, "Provisions, Navy," while the material used for the same job is charged to "Contingent, Supplies and Accounts." Actually the cost of handling a load of pig iron from store house to foundry is charged to the *appropriation for providing provisions for feeding the enlisted men on the ships.*

Since these wonderful instructions have been issued hardly a day passes that additions and modifications are not made to them. The accounts are in a hopeless tangle and no one who is in Mr. Meyer's confidence knows how to straighten out the tangle.

The statements which have been made by THE MARINE REVIEW can be verified by the navy department's own files. When the time for a real investigation comes we are prepared to prove our case. Will it ever come?

In Darkest Washington

For nearly three years THE MARINE REVIEW has persistently opposed and criticized the methods, or lack of method, in the administration of the navy department and has devoted much time to quiet investigation of yards and bureaus and our pages are rich in evidence of the extravagance and incompetence developed thereby.

That others are beginning to take note of the situation witness the following abstract of an utterance by the *American Machinist* on "Progress Toward Good Shop Management:"

> It is gratifying to note the advance that has been made in recent years in shop management. We shall not quibble as to whether we should use the term "scientific management" or "good management" as long as all are working to the same end, that is, the best work for the purpose in the quickest time at the lowest cost, with good wages to those who produce these results. * * * * * * * * * *
>
> It has also been well demonstrated that management and shop direction must be in the hands of those who have been educated for the work and who have had years of experience in the line. Year by year management becomes more nearly a science. This is almost axiomatic and it would appear needless for us to invite attention to this, were it not that we had to record one important exception to the record of progress of good management.
>
> The naval authorities, in the administration of navy yards, have violated the very elements of good management. Men whose lives have been spent at sea under naval discipline, who had no experience in industrial management and who have little or no knowledge of shop conditions or shop methods, are placed not only in control of the administration of the industrial works, but also in immediate charge of important shops. It

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seems needless to point out that this must inevitably result in very low efficiency, and a large waste of public money, and may seriously impair our national defense. It is inconceivable that such conditions should exist and we hope that immediate steps will be taken by the naval authorities to remedy these conditions.

There is no better or higher authority on the subject; no journal in the world more closely in touch with shop methods and management than the *Machinist*. It might well also have drawn attention to the fatuous policy of the department of removing or degrading every man who has given evidence of possessing any greater practical knowledge or executive ability than the academy cubs and seagoing officers who now swarm in every navy yard.

Another Document in Evidence

Navy Yard, Puget Sound, Sept. 28. —Navy yard officials have been assured beyond doubt that the big cruisers Colorado and Pennsylvania will come to this yard this winter, and preparations are being made for extensive repairs to these two ships. It was announced today that the two warships will arrive here the latter part of November, and that they will remain at this yard until next May or June.

The work on these ships will probably cost $1,000,000. New boilers are to be installed in place of those now in use, which are of an obsolete type, and the boilers and engines will undergo a thorough overhauling. The new style of skeleton masts will be installed fore and aft, and this will necessitate a change in the fire control systems of the two ships. The work of removing the massive steel masts and installing the new type is a big piece of work in itself.

The Colorado and Pennsylvania are now at the centennial celebration at Valparaiso, Peru, and will come north at its close.

These ships will not take part in the fall target practice but will come to this yard as soon as practicable for repairs.

The arrival of these ships at the navy yard and the employment of several hundred skilled workmen, together with the 1,700 sailors on these two ships and the money spent in wages, material and supplies, will give Bremerton one of the busiest winters in her history.

The Colorado and Pennsylvania have only just left the Bremerton yard (about Aug. 10) after an overhauling extending over more than 4 months and during which extensive repairs were made to boilers and engines. They have crawled as far as Valparaiso and must now after two months service, return to be overhauled again! They could not even take part in target practice!

Both ships have only been in commission a little over five years. They left the yards of the builder early in 1905 after exceedingly satisfactory trials during which both exceeded their contract speeds, and one without even a preliminary trial, and the "obsolete" boilers, as certified to by naval officers detailed for the trials,[1] made more steam than was required and "were blowing off during practically the whole run." The boilers are of the Niclausse type, built by the Stirling Co., Barberton, O. However, the act of gracefully swallowing oneself, or even his fellows, has been heretofore pointed out as one of the accomplishments of a United States naval officer, as, witness the following extracts from the report[2] of a board of engineer officers detailed to make a series of tests of the boilers at the works of the maker:

> The following tests of a Niclausse boiler of the improved marine type were made at the works of the makers, the Stirling Co., at Barberton, O., by a naval board, consisting of Captain J. A. B. Smith, U. S. navy; Commander W. B. Bailey, U. S. navy, and Commander W. M. Parks, U. S. navy.
>
> The principal object of the tests was to determine whether the proportions of the boiler were such that it could be forced to a high rate of coal combustion without injury. Careful data were also taken to determine the efficiency of the boiler at the various rates of combustion.
>
> The board first carefully examined the boiler to be tested, and inspected the arrangements made for the tests. * * *
>
> Before beginning the construction of the boilers for the battleships Virginia and Georgia and the armored cruisers Colorado and Pennsylvania, the resources of the Stirling Co. were freely used in elaborate experiments to find out the proper proportion of headers, nipples, steam drums and other details for this type of boiler to render it safe and economical under conditions of forced draft. The important question of baffling was also investigated. The result has been the production of a boiler that retains little of the foreign type, save the principle and the general outline, and a boiler that these tests show to be safe, economical and durable under forced-draft conditions.

Now these durable boilers which have not been under actual steam conditions, to say nothing of forced draft conditions, one half the time since they were built, are to be scrapped, when they ought to be as serviceable as ever and for another 10 or 15 years.

[1]Journal American Society Naval Engineers, November, 1904; February, 1905.

[2]Journal American Society Naval Engineers, 1904.

THE MARINE REVIEW holds no brief for any type of boiler and merely quotes the department's own records and reports to prove the incompetence and extravagance running riot in the navy, but takes the opportunity to say that boiler design and boiler performance are today substantially what they were when these reports were made and the Colorado and Pennsylvania were built and that the results of these tests, as stated in the board report quoted above, show the boiler efficiency to have been very high indeed, the corrected evaporation per pound of dry coal running from 11.85 lb. with air pressure of 0.5 in. to 10.19 lb. with 2.66 in. air pressure and that so few boilers, "obsolete" or otherwise, ever do better, that claims of higher duty are looked upon with strong suspicion.

It is to be hoped a kind providence may long postpone the day when we need to look to our navy for anything more than helping to make a holiday. However, with engineer officers who don't know a boiler from a galley range and whose only idea of engine room service is that it is a beastly bore and that it ought to be abolished entirely, what else is to be expected? And then a navy yard is a whole lot more comfortable than being at sea and whether one has any experience or knowledge or not makes no difference; Uncle Sam is a good, as well as a tolerant, paymaster.

Lieut Edison E. Scranton, of the navy, has been tried by a court martial and sentenced to a loss of ten numbers in his grade and this sentence has been approved by the navy department. The officer was engineer officer of the Indiana during a midshipmen's cruise abroad and the machinery of the vessel was damaged by reason of *some tools having been left in one of the engine cylinders after the cylinder had been opened for repairs.*

The United States life-saving tug Snohomish is being repaired at The Moran Co.'s yard, Seattle. The work includes an extension of the upper deck for better protection from the seas found at the entrance to the Straits of San Juan de Fuca, where the Snohomish is stationed.

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Influence of the Erie Canal

Editor MARINE REVIEW:—It is now confidently reported that the New York State barge canal will be finished for the opening of the season of 1914,at least a year sooner than was at first supposed to be possible. The work is progressing at a rapid rate, so that the payments to contractors are getting to be over $1,000,000 a month and increasing fast. This sets the transportation people and heavy shippers to figuring on the probable method of handling the new canal as a continuation of the lake route. Of course, nobody is trying to adapt lake craft to the new conditions. The new barge must be cheaper and lighter than anything of that sort. It has always been a great point in canal traffic that the conveyance may be of much less cost than its cargo, which is not true of lake craft to any extent and not often in rail traffic, nor even of a lumber wagon sometimes.

It is this fact more than any other that will make it profitable to reship the lake cargoes at Buffalo, though back of that the hard work done in Buffalo for the canal was that the city interests alone, as a manufacturing center and not as a transfer point, demanded the cheap waterway. The through traffic will be welcome and taken care of, but that is an incident now. Buffalo is filling up with iron furnaces and manufactories that are resultants of them, so it is now stated that a single iron concern here, with six furnaces for the production of pig iron, is figuring on a canal fleet, though it has not gone far enough yet to settle the question whether it will pay to build a fleet of the present-size boats for the three seasons that are between this and the new canal or to wait and put on a fleet of 2,000-ton barges for 1914. This will be done at any rate, the idea being that a steamer with five consorts is the proper figure.

The old lake package-freight lines are not going to let the traffic on the new canal go to individuals, though. They feel quite safe for the most part in their notion that they can control the traffic for the most part. They have the terminals, as nobody else has, and four of them, the New York Central, Erie, Lehigh Valley and Anchor line, maintain canal fleets now, leasing the boats. They admit that the business is not satisfactory, but they will stick to them and then expand them into 2,000-ton capacity as the new canal comes in. It will be easy to do that. It is figured that a barge-canal steamer capable of towing five others, the fleet together carrying close to 12,000 tons, will cost $40,000 and the barges a matter of half that amount. The cost is too great for individuals to take up, unless they stand very close to the big rail lines.

There are still bitter enemies of the barge canal down the State, who hold that it was a piece of folly to try to revive that traffic, though jealousy of Buffalo has animated much of the opposition. Still if the new barge will reduce the rate of freight one half, it will give Buffalo and the route entire an advantage that no other interior point can approach. It is believed that it will do just that thing. Buffalo is now receiving its ore from the lake steamer to the furnace direct and the Niagara river is steadily adding to its capacity. Two new smelting furnaces will be added by the Rogers-Brown Iron Co. next season, there being close to 20 of them now on the Niagara Frontier.

It is a great source of pride and distress at the same time to note that the harbor side of Buffalo is already getting to be terribly smoky. The timid citizen is moving farther and farther northward to get out of the line of smoke and the lake vessel owner and business man generally is rubbing his hands and asking for more smoke, for that means more business. The iron industry is not only here to stay, but it is growing fast and at the same time has merely begun to grow. From being a small ore receiver a few years ago, the port is one of the four largest in that line on the lower lakes.

Friends of the canal already see it beginning to restore the line of flourishing villages and cities that the old canal created during the first half of last century, but only to see a great part of them get out of step in late years and stand still, waiting for another boost. It has seemed that the State owed them something and now it is trying to pay that debt. It is true that the competition by rail is greater now than ever before, not only in actual rates, but in dispatch, which is a great matter. The lake lines state that they are carrying flour from Minneapolis to New York, by lake-and-rail, in six and one-half days, and that they can do it right along when conditions are normal. This means so much less of the delay that has always attended the rail traffic.

Of late years the canal has been doing quite well. The fleet has been reduced so that the traffic does not any longer make much showing as against the rail lines, but it has modified rates always and it always will, so long as there is a boat doing business. It has carried about 8,750,000 bushels of grain this season, which is an increase of over 1,000,000 bushels every year lately. With a stir attendant on getting ready for the enlarged canal, the traffic will grow steadily till that time.

JOHN W. CHAMBERLIN.

Contract for Car Ferry

President James C. Wallace of the American Ship Building Co. closed contract on Sept. 17, with the Pere Marquette Railroad Co. for a car ferry to replace Pere Marquette No. 18, which foundered on Lake Michigan. As the contract calls for her delivery on Jan. 15 next she will be built on Lake Michigan and the yard at South Chicago has been opened for that purpose. It will be observed that under the terms of the contract this car ferry is to be built in practically ninety working days, which is a very considerable performance.

The new car ferry will be 350 ft. long, 56 ft. beam and 19½ ft. deep. This is the third order for car ferries that has been placed in lake yards during the present year. The American Ship Building Co. recently delivered Marquette & Bessemer No. 2 to the Marquette & Bessemer Dock & Navigation Co. at Conneaut.

The Toledo Ship Building Co. is building a car ferry for the Ann Arbor Railroad Co. for service between Frankfort, Mich. and Manitowoc, Wis. She will be delivered in December.

Car Ferry Design

It is intimated that the railway companies operating car ferries in the open lake are arranging to have tightly fitting hoods placed on the hitherto open sterns of the vessels. This action is traceable to the recent loss of car ferry Pere Marquette No. 18 with the sacrifice of 28 lives. The subject of car ferry construction will also be discussed at the next annual meeting of the board of supervisors of the Steamboat Inspection Service in Washington next January. Concerning this C. H. Westcott, supervising inspector with headquarters at Detroit, says:

"In addition to the closely fitting hood on the stern I shall advocate the closing of all deadlights on the under side of the vessel, either by eliminating these openings altogether, or by placing over them a covering which shall extend to the height of the upper deck, the top being left open for ventilation. If deadlights on the outside are done away with, they could be replaced by an artificial system of ventilation in the hold of the steamer or by ventilator holes through the middle of the longitud-

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inal section of the main deck, placed in line with the smokestacks and equipped with a covering, the top of which shall be at least as high as the upper deck level.

"It seems to me a change also should be made in the ventilators opening on the main deck from the engine room. On most of the car-ferries these openings are located in the sides of the ship. They have no other covering than an iron grating and the edges are protected only by a 3-in. coaming.

"I will recommend that these ventilator openings be removed to the space in the longitudinal section of the deck, between the tracks, and in line with them and that they be inclosed by a sheet iron covering with the top extending as high as the upper deck, or that some other equally good system of artificial ventilation for the engine room be substituted for them."

Steamer New York Founders

The old wooden package freight steamer New York, commanded by Capt. Moses W. Humphrey, of Detroit, foundered off Thunder bay, Lake Huron, on Oct. 2, after an all night struggle against a heavy sea. She was towed to Owen Sound with a cargo of 2,000 tons of coal. When it became certain that the New York had foundered the captain ordered the crew to the yawl boats and all got away from the sinking steamer safely. They were later picked up by the steamer Mataafa and taken to Port Huron. Capt. H. J. Regan of the Mataafa says that he was greatly aided in picking up the wrecked seamen through the liberal use of storm oil which quieted the seas as the yawls approached. The New York was not insured. She was built in 1879 for the Erie Railroad Co., but was sold several years ago to the New York Steamship Co., of Detroit.

Iron Ore Shipments

Notwithstanding the great subtraction of tonnage from the active fleet, ore shipments during September passed the 6,000,000 mark, being 6,273,832 tons. This is a decrease of 771,153 tons over the movement during September, 1909, and is a decrease over the August shipments of the present year of 690,549 tons. August in itself showed a decrease of 228,818 tons over July, so that the movement of ore has sensibly fallen during the past two months. This slump will probably be accelerated from now on, as vessels are fast going to dock. The Pittsburg Steamship Co. is through with quite a great deal of its chartered tonnage and will be through with the balance within a week. In October, 1909, the fleet moved 6,625,801 tons, which, it will be seen, is somewhat more than was moved in September of the present year. It is not expected that the October movement will reach the figures of 1909, though the total movement for the season will show quite a respectable increase over that of 1909. The increase to Oct. 1 is 5,461,331 tons. During the remaining months this lead will be cut down somewhat. However, it is practically certain that the total shipments for the year will be between 46,000,000 and 47,000,000 tons. Following is the summary:

Port.	Sept., 1909.	Sept., 1910.
Escanaba	948,951	705,801
Marquette	565,949	439,442
Ashland	721,236	557,858
Superior	1,057,175	1,256,665
Duluth	2,133,800	2,041,908
Two Harbors	1,623,874	1,272,158
Total	7,050,985	6,273,832

1910 decrease, 777,153.

Port.	To Oct. 1, 1909.	To Oct. 1, 1910.
Escanaba	4,002,796	3,868,072
Marquette	1,979,517	2,689,219
Ashland	2,422,004	3,436,829
Superior	4,743,498	6,484,352
Duluth	9,847,177	11,865,552
Two Harbors	6,644,541	6,756,840
Total	29,639,533	35,100,864

1910 increase, 5,461,331.

The season on the great lakes will end very quietly, more quietly than for many years, the closing weeks offering no attractions to anyone. The ore movement is entirely cared for by contract ships. Wild vessels that take coal up have to return without cargo and there is certainly no money in carrying a tonnage of coal to the head of the lakes for 30 cents and coming back light. The season will definitely close on Nov. 30, after which time no ships will leave port. As for the grain trade there is nothing in it, the rate from Duluth being 1 cent and even less than that from Chicago.

September Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of September, 1910, as follows:

Lakes.	Feet above tide-water, New York.
Superior	601.99
Michigan-Huron	580.30
Erie	571.86
Ontario	245.70

Lake Superior is 0.03 foot higher than last month, 0.41 foot lower than a year ago, 1.05 feet below the average stage of September of the last ten years, 1.83 feet below the high stage of September, 1876, and 0.50 foot above the low stage of September, 1879. It will probably remain about stationary during October.

Lakes Michigan-Huron are 0.05 foot lower than last month, 0.50 foot lower than a year ago, 0.73 foot below the average stage September of the last 10 years, 3.13 feet below the high stage of September, 1876, and 0.55 foot above the low state of September, 1896. They will probably fall 0.2 foot during October.

Lake Erie is 0.21 foot lower than last month, 0.48 foot lower than a year ago, 0.55 foot below the average stage of September of the past ten years, 2.06 feet below the high stage of September, 1876, and 0.60 foot above the low stage of September, 1895. It will probably fall 0.3 foot during October.

Lake Ontario is 0.35 foot lower than last month, 0.58 foot lower than a year ago, 0.47 foot lower than the average stage of September of the last ten years, 1.67 feet below the high stage of September, 1883, and 1.70 feet above the low stage of September, 1895. It will probably fall 0.4 foot during October.

Commerce of Lake Superior

The commerce of Lake Superior as measured by the canals of Sault Ste. Marie, totaled 8,790,374 tons during September, which is a falling off of 954,182 tons from the movement of the preceding month. The movement to Oct. 1, however, shows an increase of 9,797,726 tons over the corresponding period of 1909. Following is the summary:

EAST BOUND.

	To Oct. 1, 1909.	To Oct. 1, 1910.
Copper, net tons	79,891	95,653
Grain, other than wheat, bush.	18,284,176	25,202,054
Building stone, net tons.	1,129	8,365
Flour, bbl.	3,828,826	4,766,452
Iron ore, net tons	28,107,722	34,282,282
Pig iron, net tons	21,411	23,411
Lumber, M. ft. B. M.	394,973	472,614
Wheat, bus.	40,279,688	40,771,839
Unclassified freight, net tons	108,029	119,793
Passengers, number	27,157	29,483

WEST BOUND.

Coal, anthracite, net tons	916,740	1,209,289
Coal, bituminous, net tons	6,122,058	8,896,296
Flour, bbl.	2,355	1,110
Grain, bush.	1,000	2,153
Manufactured iron, net tons	323,950	289,519
Iron ore, net tons	13,108	.....
Salt, bbl.	483,967	427,248
Unclassified freight, net tons	634,080	871,261
Passengers, number	28,342	32,711

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons	30,957,325	37,507,279
West bound, net tons	8,082,123	11,329,895
Total	39,039,448	48,837,174

The total number of passages to Oct. 1, 1910, were 16,115, and the net registered tonnage, 39,634,123.

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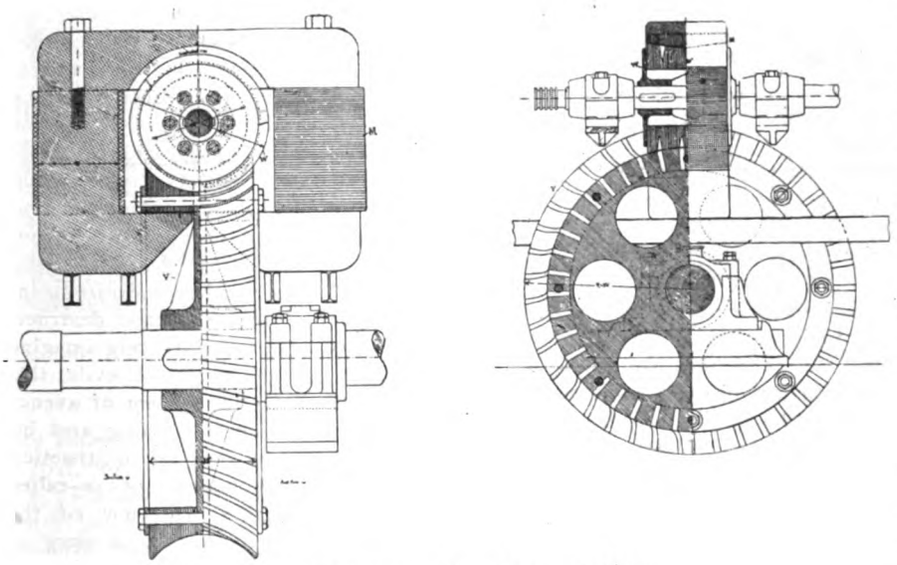
ELECTRO-MAGNETIC TRANSMISSION FOR MARINE PROPULSION*

By Jules Lecoche.

IT IS now generally admitted that the combination of a reciprocating engine with an exhaust steam turbine provides the most satisfactory solution of the problem of marine propulsion, whenever a high efficiency is of paramount importance. However, when he comes to put this principle into practice, the marine engineer is soon confronted with a number of difficulties which, while not actually insuperable, are only got over at the cost of both the efficiency and simplicity of the arrangement.



300-H. P. Magnetic Gear, Speed 3000/75.

The use of two propellers driven by the reciprocating engine and by the turbine respectively need hardly be taken into consideration on account of the great difference between the speed and brake horsepower of both machines. Under these conditions, the only solution lies in an arrangement whereby the power of the turbine is transmitted, at a suitably reduced speed, to the main, or reciprocating engine shaft, so as to assist the latter in the propulsion of the ship. A mechanical speed-reduction gear suggests itself as the simplest realization of this arrangement. However, it must be remembered that, under certain conditions of the sea, the reciprocating engine of a boat shows a marked tendency to race; a tendency which is by no means equally shared by the turbine.

Difficulties of the Problem.

If, therefore, the connection between both machines is effected by means of the usual system of gearing, the teeth of the latter will in all probability be stripped off, as soon as, from some reason or other, the resistance on the main shaft is appreciably reduced. If to this we add the noise, vibrations, wear and tear and the comparatively low efficiency of mechanical gearing for such high ratio as 3,000/75 R. P. M., it will be reasonably admitted that no mechanical gear can afford a satisfactory solution of the problem before us. Other means for transmitting power and simultaneously reducing the speed are the hydraulic and electrical transmissions, both of which have been tried in connection with marine propulsion. The former alternative, as conceived at present, can hardly be expected to meet the requirements of the marine engineer on account of its comparatively low efficiency, excessive wear, weight and cost. The second alternative, namely, the electrical transmission, appears very attractive from the point of view of flexibility and ease of control. However important these factors undoubtedly are, other conditions must be complied with before an electric transmission can be conveniently adopted for the purpose in question.

The first of these conditions is a high efficiency. In speaking of this system as a "transmission," one is apt to forget that the actual transmission is only part of the process, the latter being essentially a "transformation" of mechanical power into electrical energy, and again of electrical energy into mechanical power. Taking into consideration the individual efficiency of each single element (generator and motor) of this transmission, it will be found that the combined efficiency cannot be very high, especially when the motor is designed to run at such low speed as 75 R. P. M. Other serious drawbacks of this system are the weight and cost of the slow-running electric motor and also the necessity of resorting to high tension voltage, the presence of which is more or less unwelcome aboard ships.

Application of Magnetic Gear.

The application of the "magnetic gear" to marine exhaust-steam turbines was suggested on account of its high efficiency, noiselessness, positive drive, cheapness of upkeep (there being no wear and no need for lubrication, except in the bearings) and, last but not least, on account of this valuable peculiarity that, as soon as the reciprocating engine begins to race, the transmission comes automatically out of gear, thus effectively protecting the machinery against injury. Compared with both dynamo and motor, the magnetic gear has the advantage that it requires only a nominal amount of electrical energy. In fact, the latter is only an accessory, and the current being of comparatively low voltage can usually be supplied by the existing lighting sets. Although the simplicity of construction and action of the magnetic gear is almost suggested by the name itself, I think a brief description of the machine may be found of interest.

The illustration shows a magnetic

*Read at the Naval and Enginering Exhibition, Olympia, on Saturday, Sept. 17.

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frictionless gear of the screw type for an exhaust-steam turbine of 300 B. H. P. running at 3,000 revolutions per minute; through this gear the power of the turbine is transmitted to the main propeller shaft driven by the reciprocating engine at a speed of 75 revolutions per minute. Such a high speed reduction is possible in this case, owing to the fact that the absence of friction between the working parts allows such high circumferential velocities as would be quite unpracticable with mechanical gearing; besides, apart from the bearings, there is no need for lubrication, and this is a point not to be depised. Unlike an electric motor, the revolving parts of the magnetic gear carry no winding whatever, so that the empty slots and helical grooves of both wheel and worm provide for a perfect cooling. The three main parts of the gear are: The field magnet M, the laminated worm W, the wheel V.

The Field Magnet.

The field magnet, made of cast steel of high magnetic permeability, is of the Manchester type; its top pole-piece is laminated in order to prevent losses and heating from hysteresis and Foucault currents. The coils are wound with high conductivity copper wire properly insulated. The worm is made up of iron stampings fixed concentrically on two cast iron spiders, in exactly the same way as the armature core of a motor or dynamo. One end of the worm shaft is coupled to the turbine. The end-thrust is either entirely or partially balanced by that of the turbine. A thrust-bearing is shown at the other end of the shaft to take the unbalanced thrust. The wheel, being subjected to a side-thrust due to the angularity of the teeth, partially relieves the thrust-blocks of the propeller shaft. The wheel V has a hollow rim made up of sprockets of soft iron coarsely laminated; these sprockets have the same angle, width and pitch as the threads of the worm opposite which they move with a clearance of about ¼ in. This wheel is keyed on the propeller shaft driven by the reciprocating engine at 75 revolutions per minute. To clearly understand how the tangential pull on the rim of the wheel is obtained by means of apparently perpendicular lines of force it must be pointed out that the latter are not actually normal to the circumference of the wheel, but owing to difference in the degree of saturation of the iron sprockets due to a slight advance of the worm threads under load the lines of force cross the air gap at an angle, dragging the wheel in the same way as the armature of an electric motor is pulled back into the field when shifted along its center line.

Losses in the Magnetic Gear and Speed-Reduction.

The transmission losses are, the electrical energy necessary for exciting the magnetic field and the hysteresis and Foucault-currents in the iron of the worm and wheel.

Field Excitation.

From experiments I have made, I found that a magnetic density of 15,000 lines per square centimeter are required to give a tangential force of 22 lb. per sq. in. of iron face. With a total air-gap of one centimeter, a number of ampere-turns equal to 800 × 15 = 12,000 is required for producing the necessary magneto-motive force; as there are two parallel magnetic circuits (wound in series) it will really be 24,000 ampere-turns, to which we must add 6,000 ampere-turns to overcome the resistance of the iron circuit, and this brings the total to 30,000 ampere turns. Let us now assume that the pressure of the electric supply is 120 volts, that the wire with which the coils are wound has a sectional area of 0.012 sq. in., to which corresponds an ohmic resistance of 0.2 ohms per 1,000 yd., and that we allow a current density of 1,000 amperes per sq. in., say 10 amperes for the section of our wire; then, 3,000 turns of such wire will be necessary to give the 30,000 ampere turns required. The length of each turn of wire being 2 yd., the total length of the electric circuit will be 6,000 yd., whose total resistance (at 2 ohms per 1,000 yd.) is 12 ohms. The formula R = I = E, in which R is the resistance of the circuit, I the intensity of the current, and E, the electro-motive force, is verified; 12 ohms × 10 amperes = 120 volts. The total electrical energy corresponding to these figures is: 10 amperes × 120 volts = 1,200 watts, which is less than 1 per cent of the total power transmitted (300 H. P.).

Loss Through Hysteresis and Foucault Currents.

Owing to the laminated state of the worm, and also the sprockets of the wheel, the loss through eddy-currents and hysteresis is very low and always less than 4 per cent of the total power, which, added to the 1 per cent of the field excitation, will give a total transmission loss of 5 per cent.

The total weight of the 300 B. H. P. gear for reducing the speed from 3,000 to 75 revolutions per minute is 11 tons, of which 2 tons for the worm with its shaft and bearings, 4 tons for the wheel and 5 tons of the field magnet. Comparing these figures to electrical transformation, it would be in the latter case: One 250 K W dynamo at 3,000 R. P. M., 3 tons (approximately); one 300 H. P. motor at 75 R. P. M., 27 tons (approximately); total 30 tons. The magnetic gear can run in both directions if the turbine is reversible, if such is not the case, the excitation is cut off by means of a switch, and the reciprocating engine gives alone the reverse motion without the assistance of the turbine.

Aerial Navigation

Editor MARINE REVIEW:—It would not be at all surprising if navigation among the clouds should soon pass beyond the experimental stage and as now being freely prophesied by many that such aerial vehicles will become mighty engines of destruction in times of war, being a method that any nation may adopt and put into operation upon slight provocation, invading any country by day or night, dropping most terrible explosives into great cities with the most destructive effects. One can scarcely imagine any limit to the train of evils that would follow such a system of avenging a real or fancied wrong and inaugurating a system of destruction for outside the bounds of so-called "civilized warfare." In view of the rapid development in the science of traveling through space at a desired height with its threatening possibilities and even probabilities, such conditions may speedily bring about an alliance between the principal nations of the earth declaring for arbitration of all international questions, clothing itself with ample power to enforce the declaration, and thus turn this threatening engine of destruction into a channel that will entirely reverse its operation and effect so as to work out the problem of universal peace between the nations of the earth through sane and civilized arbitration. JAMES STONE.

Cleveland, Oct. 10.

The steamer Felix Carbray, formerly the John C. Gault, owned by F. B. Chesborough, Emerson, Mich., will go to the coast this fall.

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A NEW DESIGN OF GRAB BUCKET

THE accompanying illustrations show quite clearly a type of grab bucket which has been perfected after trials and experiments extending over two years by the Andresen-Evans Co., Chicago, for handling all kinds of bulk materials, more especially iron ore, cement clinker, coal, etc.

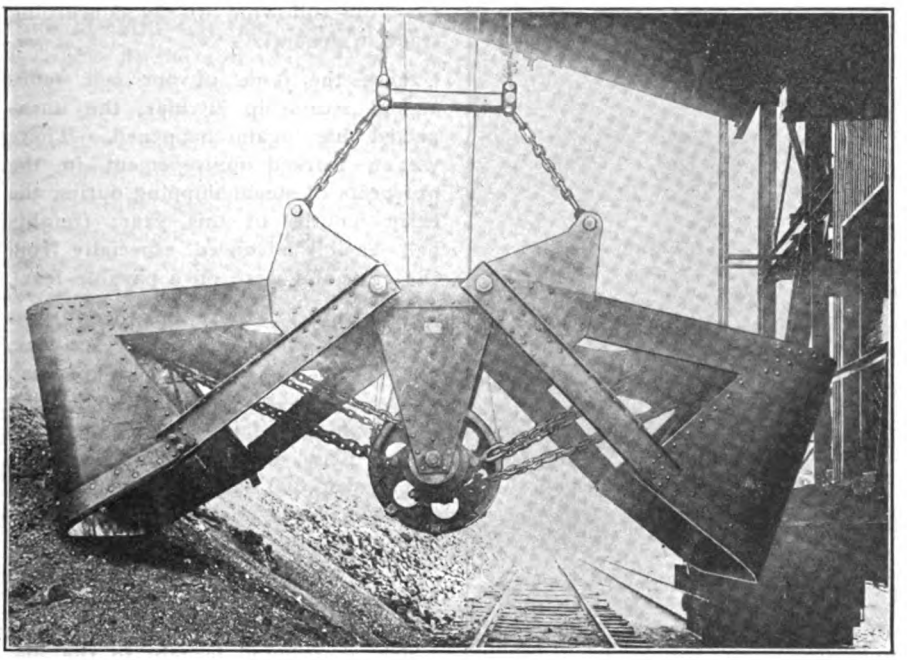

FIG. 1—SEVEN AND ONE-HALF-YARD, TYPE A, COAL BUCKET ON CONVEYOR BRIDGE, OPEN.

Up to within the past few years the greater proportion of plants for handling bulk materials, and coal in particular from ship to storage, have been very much of one type, consisting of hoisting towers equipped with double drum engines handling the commonly known clam-shell buckets. Improvements made within the last 10 years in ore handling and storage equipment have also affected the practice in handling coal, and results that were considered satisfactory with the old type hoist and 1½ to 2-yard capacity clam-shell buckets are not acceptable to present day management.

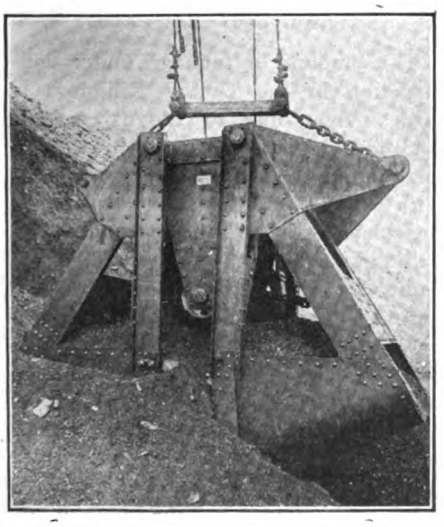

FIG. 2—SEVEN AND ONE-HALF-YARD BUCKET, HANDLING POCAHONTAS COAL, DIGGING IN SIDE HILL.

In some respects a resemblance will be noted to other types of buckets, including the differential drum, but in most others it differs from all other types. One of the essential differences to be noted is that the differential drum is mounted in a separate central frame, which also carries the bearings for the hinge shafts on which the scoops are pivoted. Another difference may be noted in the transmission, in which four two-part chains are used. The common complaint of operators of older types of grabs is that the buckets will not fill to capacity except in hard coal or the easiest-digging kinds of mine-run soft coal, and the latter only after the bucket has been dropped from 15 to 20 feet to obtain penetration. In unloading ships this practice has been productive of great damage to both buckets and ships, and large bills have been attendant upon the severe treatment, but the greatest damage from a financial standpoint is due to the excessive breakage of coal and the resultant increased amount of slack or screenings. With these buckets, the maker's claims are that it will fill to its rated capacity in all such hard-digging coals as splint, black-band, etc., and that it will work equally well in free coal, side-hill, hatch or winging.

As will be noted from the illustrations, this new grab has, in common with the more familiar clam-shells, a main differential drum for closing, but here the similarity ends, for the drum is not pivoted on an extension of the scoops but, as already noted, is carried by a separate central frame in which the hinge shafts also have their bearing. In this feature of separate pivots for the scoops this bucket differs also from the clam shells, and this is an element in more than one way in securing the good digging results obtained; first it gives an exceedingly wide opening, over 50 per cent greater than the clam shell, and second it gives with a simple motion the peculiar digging path and the cutting edge that is obtained in other buckets by the use of separate pivots for front and back of each scoop. This advantageous cutting path, combined with the long reach, insures a full bucket, even in cleaning up where the material is somewhat scattered.

The closing action is produced by four closing chains, seen in the illustrations, pulling in a direction practically parallel to the line of resistance and working against this resistance with a long lever arm, securing thereby a most powerful closing effort, and

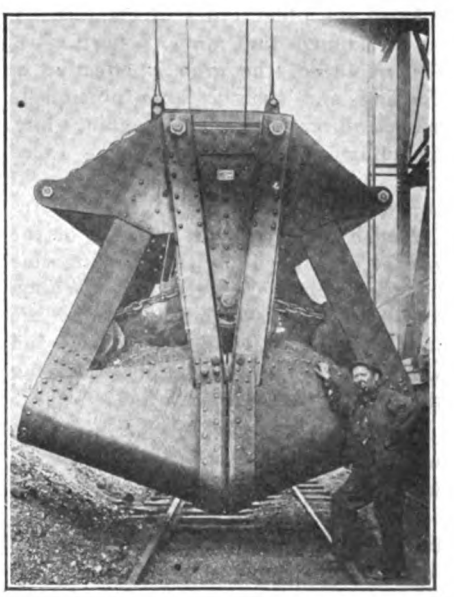

FIG. 3—SEVEN AND ONE-HALF-YARD BUCKET, CLOSED.

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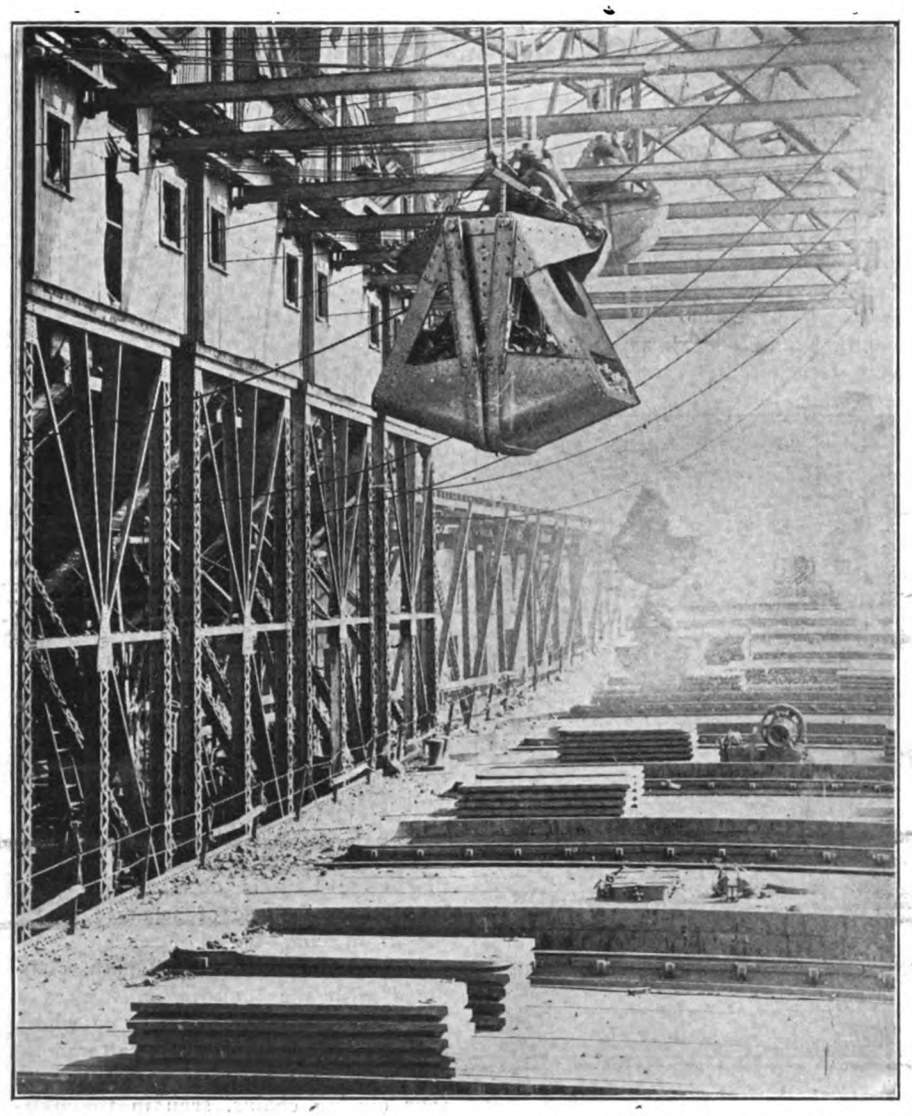

FIG. 4—THREE-YARD, TYPE A, BUCKET ON COAL HOIST, UNLOADING SHIP.

entirely without the use of compound motions.

With the older types of clam shells, it is claimed that only a portion of the weight of the grab is effective in opening and that a large portion is carried directly by the opening line, including the top frame and brace links and a considerable portion of the weight of the scoops. In the Andresen-Evans grab, not only all of the weight is carried by the opening line but this weight is effective in opening, due to the positive pull caused by the toggle action on opening chain and which results from simply releasing the brake on the closing line.

With the flat path followed by the scoop jaws in opening, it is not necessary to hold the grab high above the hopper or stock pile when dumping. In fact, when delivering to stock pile, it is possible to lay the coal on the pile without altering the usual method of operation, thus eliminating another factor in coal breakage. When open the center of gravity of the bucket is low down and it is possible to work successfully on the side of a pile, there being little tendency to tip over. In this position also, the head room required is small and it is therefore easily swung between the decks for winging or cleaning up between hatches or for clearing out track hoppers, bins or similar spaces where superstructures prevent direct vertical digging. In marine work this feature is of special value, as the wide opening enables the grab to reach well from one hatch to another and eliminate most if not all hand shoveling.

Since economical operation demands that the weight of material handled shall bear a high ratio to the gross weight, special effort has been made to secure maximum capacity with minimum weight of construction, and it is claimed that in this bucket the proportion of net load is higher than in any other.

Of course the same advantages with respect to digging, clearing out and net load are true in the case of ores and other materials as well as with coal. The type A bucket described herein is designed for two-line operation. Type B is for three or four1line operation, and both are built in three different weights for each size, ranging from 1 to 7½ cubic yards.

Trade Shows Improvement

H. E. Moss & Co., of Liverpool, in their semi-annual steamship circular, have the following to say concerning trade in general:

Since the issue of our last semi-annual steamship circular, the unexpected has again happened. There was a marked improvement in the prospects of steam-shipping during the early months of this year; freights had sensibly advanced, especially from the east, and were on a payable level.

Unfortunately, there has been what we hope is only a temporary set-back, the result, in our opinion, of two main factors—the principal one being the unexpected failure of the harvests in La Plata, which suddenly necessitated over 100 large steamers being forced to seek employment in other directions and causing a general decline in freights; the other factor may be attributed to the troubles at home in the coal trade (now happily ended) which contributed largely to the dislocation of business, and delayed the improvement we had all expected. The coming harvests, at home and abroad, it is anticipated will this season be most bountiful, and it is hoped, with cheaper breadstuffs and the continual increase in the volume of our trade, we may look forward to a gradual improvement from this autumn onwards.

The amount of tonnage under construction in the United Kingdom is large. According to Lloyds' returns for the quarter ending March 31, 1910, it amounted to 1,057,636 tons compared with 912,272 tons for the corresponding quarter of 1909, and there was also a similar increase, say about 150,000 tons, as compared with the same period ending Dec. 31 last. For the quarter ending June 30 we anticipate the tonnage under construction will prove to be about the same as on March 31. These figures are much less than they have been in former years, but are still too large for present requirements, as the amount of tonnage launched from Jan. 1 to March 31 this year was about 50 per cent greater than for the correspond-

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ing period of last year, and we expect will maintain the same level up to June 30.

Large numbers of contracts, principally for liners and special steamers, were placed during the last six months, the low cost of construction tempting many owners to reconstruct their fleets, but at present the demand has practically ceased and, while some builders are fairly well off for work, there are many very keen for orders, and contracts can be placed today practically as cheaply as they have been recently; but this cannot remain for long, as the cost of production is bound to advance proportionately with the increased cost of material and labor, and there are signs ahead of coming advances.

New tramp steamers of about 7,500 tons deadweight, with ordinary specifications, can be built presently at £5 per ton; in fact, a few contracts for steamers of this size have been made at less, and other vessels of smaller tonnage at proportionately increased cost. Some new steamers of 6,500 tons have been sold at £5 per ton deadweight, but now they have been disposed of there are not many new vessels left on the market.

Second-hand cargo steamers can still be bought very cheaply, but they are difficult to sell, owing to the demand at present being so small, whereas the value of handy passenger and cargo steamers is appreciating, and many have recently been sold at good prices.

The amount of obsolete tonnage unsold is still very large, and as most of the shipbreakers are well bought, the value of such steamers has fallen. We have said for years past that there are hundreds of thousands of tons of antiquated vessels that must be demolished—there is no other course open—and the sooner the inevitable is faced the better for all concerned. Our government is adopting this course with regard to its old war vessels.

The leading feature of the last six months has been the growing disposition for the amalgamation of shipping interests, and the formation of large trusts. We have recently seen the Lund line absorbed by the P. & O., the Pacific Steam Navigation Co. has also been acquired by the Royal Mail Co., and a well-known Australian line, it is said, will soon be bought up by one of its colleagues. The important interests of Elder, Dempster & Co. have also been consolidated under one management.

Coaling Station at Tiburon

THE navy department has completed the coaling station for vessels at Tiburon on San Francisco bay opposite the Golden Gate, and approximately eight miles from San Francisco. This station is by no means elaborate, but has a maximum loading capacity of 500 tons per hour. It consists of a deep water wharf running parallel and about 150 ft. from the shore, with a storage bunker on shore of about 10,000 tons capacity. On both sides of this bunker are concrete floors serving as storage areas and having capacity about equal to that of the bunker.

The minimum depth of water at the pier is 30 ft., enabling the largest vessels to coal. Obviously the pier itself forms a harbor in which small vessels may be sheltered, though the usual practice is for the large ships to load on the exposed side. Provision has been made for two independent methods of coaling. Coal may be transferred directly from barges on one side of the pier to a ship on the other by means of two traveling towers, each of which is equipped with a grab bucket. The second method is to bring the coal by means of a cable railway from the storage bunker on shore which is connected with the coaling pier by a trestle. The coal intended for storage is taken from the colliers by the grab bucket of the traveling tower on the deep water pier and deposited into small cars which are hauled over a connecting trestle to the top of the storage bunker and there automatically dumped. When these storage bunkers fill up, new shipments are discharged from the cars through chutes to the emergency storage on both sides of the bunker.

A similar cable system is used for carrying coal from the storage to the ships. Two tracks are laid underneath the bunkers and the cars are loaded by gravity. They are then hauled out and up an incline on a trestle where they proceed to the coaling pier and discharge their loads into continuous lines of shallow hoppers on both sides of the pier. The operation of this system does not interfere with the transfer of coal directly across the pier from barges to ships with either one or both towers. Coal brought from storage by the cars and deposited into the shallow hoppers is chuted by gravity to vessels.

Each tower can transfer coal across the pier at the rate of 200 tons per hour, while at the same time the car system can be in operation and deliver 300 tons in the same period.

The coal deposited in the emergency storage on both sides of the bunker is reclaimed by the grab bucket on the traveling tower on the bunker and can be deposited by this bucket either into the bunker or into delivery cars on top.

The coaling pier is a double-decked structure 390 ft. long having a floored lower deck about 12 ft. above mean low water and an upper deck 38 ft. higher. The lower deck is 48 ft. wide and can be used for the storage of coal or miscellaneous material while the upper deck is 36 ft. wide between tower rails and 55 ft. wide over the coal hopper.

The pier is carried on cast iron cylinders 4 ft. in diameter filled with concrete and resting on hard bottom at depths of 30 to 70 ft. below mean water. The shore end of the trestle, beginning about 100 ft. from the pier connecting the coaling pier with the shore plant, is of timber construction and carries four tracks. The two inside or main tracks lead to the tracks on the coaling pier and to those on top of the bunker, forming a loop of the cable system. The outside tracks are connected to the main tracks at the point of beginning on a gravity switch. These tracks run shoreward beyond the bunker and then turn parallel to it, dropping down an incline until they reach grade level at a point near the end of the bunker.

Since the cars are operated by cable system they all have loops at their ends. The coal bunker is 37 ft. wide, 650 ft. long and is located about 400 ft. from the coaling pier. The construction of the steel towers on the coaling pier and on the bunker is the same. Each is a wedge-shaped steel tower about 80 ft. in height with a 30 x 36 ft. base mounted on 16 wheels on 36-ft. gage tracks. The A frame bottoms project on both sides for a distance of 70 ft. and each tower is equipped with a steam operated two-ton grab bucket. Since the tower on the coaling pier must be able to clear the rigging of the ships in order that the vessels may be unloaded or coaled without being moved from their first

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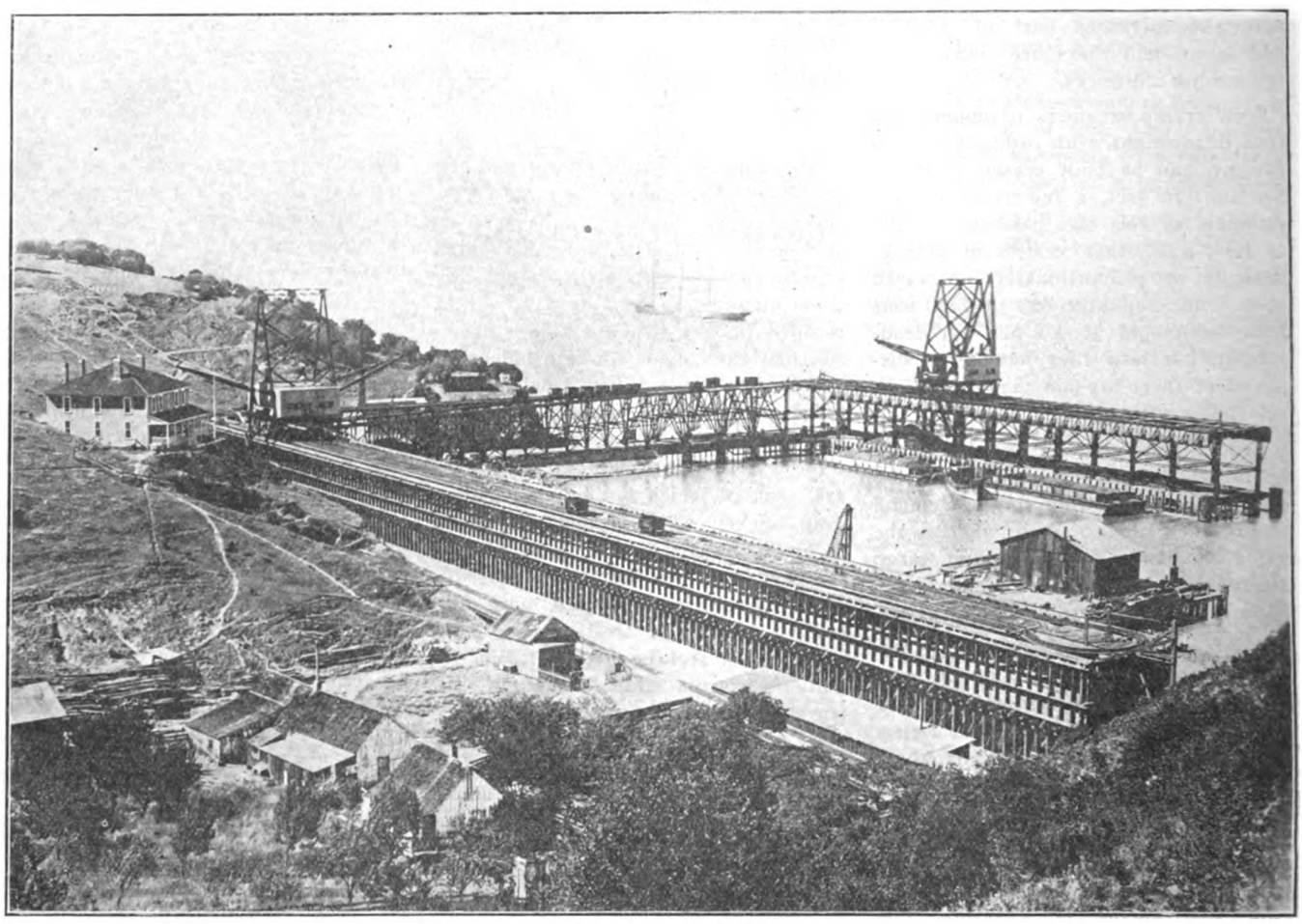
mooring, the booms can be folded back and the entire tower shifted at will.

The machinery in each tower is identical and consists of a main hoisting engine of the double-drum, two-cylinder type and reversing turbine engine and a double-drum engine for raising and lowering the booms and traversing the tower. Each tower carries two 60-H. P. boilers and a 1,000-gallon water tank.

The cable for operating the cars carrying coal from the pier to the bunkers and the one for operating the cars from the bunker to the ships are independent of each other. They are, however, interchangeable and are arranged so that cars can be transferred from one track to the other. Each car is equipped with a cable grip to permit of its being attached or detached at any point. The cars are dumped automatically where desired.

The general contract was held by the San Francisco Bridge Co. The cable system, however, was supplied by the C. W. Hunt Co., of New York, while the foundation work was done by the Snare & Triest Co., of New York.



COALING STATION AT TIBURON.

Bureau of Mines

The act establishing a Bureau of Mines in the Department of the Interior, approved May 16, 1910, became effective July 1. As originally approved, the law contemplated the transfer of the entire Technologic Branch of the United States Geological Survey, the mine accident investigations, fuel investigations, structural material investigations, the entire personnel, property and equipment, to the Bureau of Mines, but the Sundry Civil appropriation act approved June 25, amended the law to such an extent that the structural materials investigations, including the personnel and equipment for these investigations, went to the Bureau of Standards, Department of Commerce and Labor.

Carrying out the spirit and intent of the law so amended, the Secretary of the Interior has transferred to the Bureau of Mines the investigation of mine accidents and fuels, together with the personnel and equipment of these investigations and has transferred to the Bureau of Standards the structural materials investigations and the employes of the Technologic Branch of the Survey engaged in these investigations. The fully equipped testing station at Pittsburg also goes to the Bureau of Mines.

The Bureau of Mines, therefore, includes the mine accidents and fuel investigations for which an appropriation of $410,000 was made by Congress. The total appropriations for the Bureau, including salaries, rent and expenses of removal, amount to $502,200.

The work of the Bureau of Mines for the first year will be a continuation and expansion of the work carried on by the Technological Branch of the Geological Survey. The law in itself provides for a variety of other problems that properly belong to the Bureau of Mines and which should eventually be undertaken, such as methods of mining and metallurgical processes, but these activities will be deferred for the most part until Congress gives additional authorization in the shape of adequate appropriations. The spirit of the debates in Congress both on the Bureau of Mines legislation and on the appropriation items emphasized the desire to regard the mine accidents investigations as urgent and this will be the feature of the work.

In all, $310,000 was appropriated for mine accident investigations. Of this

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sum, under the general plans approved by the secretary of the interior, $120,000 is to be spent on the rescue stations, $36,000 for housing nine stations; $34,000 for equipping eight new stations; and $10,000 for additional equipment for five existing stations. The allotment for the investigation of explosives is $40,000; for electricity in mining, $14,000; appliances for preventing mine accidents, $8,000; examination and codification of mining laws, $5,000; and other technologic investigations, ore treatment, etc., $10,000. For the analyzing and testing of the coals, lignites, ores and other mineral fuel substances belonging to or for the use of the United States, $100,000 was appropriated. Of this amount, $35,000 will be spent in the chemical and physical investigation of fuels; $25,000 in the inspection of government fuel purchase; $22,000 in fuel efficiency investigations; $5,000 in lignite and peat investigations; and $4,000 in briquetting investigations.

Mine Accident Investigations.

The mine accident investigations, which have been transferred from the Geological Survey to the Bureau of Mines were first authorized in the legislative appropriation act of May 22, 1908, carrying for this purpose an appropriation of $150,000. This was followed by a similar appropriation carried in the act for the sundry civil expenses of the government for 1910. A mine experiment station was established in Pittsburg during 1908, at which, since that time, investigations of explosives, coal gas, dust, electricity and other possible causes of mine explosions have been continually under way. The mining engineering field force of the Geological Survey has already made decided progress in the study of underground mining conditions and methods. Practically all of the coal mines in which mine explosions have occurred during the last two years have been carefully examined, the gases, coke and dust have been analyzed at the laboratory at Pittsburg and every effort has been made to determine the explosibility of various mixtures of gas and air in the presence of shots of different types of explosives. Considerable progress has also been made in the investigation of explosives used in coal mining, and the conditions under which they may be used with least risk. Manufacturers have submitted many explosives for test at the station and a considerable portion of them passed and have been classified among the permissible explosives. The investigations and educational work in connection with the use of artificial breathing and other types of mine rescue equipment, the so-called oxygen helmets, have not only been useful in developing a more satisfactory use of such equipment in the examination of mine explosions, but also better methods for using this equipment in mine rescue work.

Full Investigations.

The fuel investigations under the Geological Survey and which are transferred to the Bureau of Mines have already resulted in a better realization throughout the country as to the value of fuels. One result of this work is that nearly all of the fuel now purchased by the federal government is bought on specifications and subject to test by the fuel division, or purchased after examination made of the coal supplied by the mines from which coal is delivered to the government.

The publications of the Survey relating to mine and fuel investigations, those prepared by the Technologic Branch, will in the future be distributed by the Bureau of Mines. The publications relating to structural materials will continue to be distributed by the Geological Survey. The last of the bulletins of the Technologic Branch to be published by the Survey will be issued from the Government Printing Office about Aug. 1. This bulletin relates to the Explosibility of Coal Dust, and was prepared by G. S. Rice, with chapters by J. C. Frazer, Axel Larsen, Frank Haas and Carl Scholz.

The first of the Bureau of Mines bulletins, the Volatile Matter of Coal, by H. C. Porter and F. K. Ovitz, will be published in the next few months. Then will follow: Coal Analyses, by N. W. Lord and J. S. Burrows; Final Data Regarding Steam Tests, by L. P. Breckenridge; North Dakota Lignite as a Boiler Fuel, by D. T. Randall and Henry Kreisinger; Producer-gas Tests in 1905-1907, by R. H. Fernald; The Coke Industry as Related to the Foundry, by Richard Moldenke; Coals for Illuminating Gas, by A. H. White and Perry Barker; and Petroleum for Combustion under Steam Boilers, by I. C. Allen.

These publications, when issued, can be obtained by addressing the Director of the Bureau of Mines, Washington, D. C.

United Fruit Co.'s Acquisition

The United Fruit Co. is now in complete control of Elders & Fyffes, which is engaged extensively in importing bananas and other tropical products into Great Britain and distributing them there and throughout Europe. In connection with its application to list new stock, the United Fruit Co. submitted a statement to the Stock Exchange which contained the following: "The new shares are to be issued in payment for 225,000 shares which the company has agreed to purchase in the capital stock of Elders & Fyffes, Ltd. The authorized capital stock of the United Fruit Co. is $25,000,000. The amount at present outstanding is $23,474,000, and this will be increased by the additional issue of $1,125,000 about to be made to $24,599,000. The new stock is to be issued as of Oct. 1, 1910, and will be entitled to participate in all dividends which may be declared payable on stock of record on or after that date. Elders & Fyffes, Ltd., is organized under the Companies' Acts of Great Britain, and is engaged extensively in importing bananas and other tropical products into Great Britain and distributing them there and throughout Europe. It owns, as a part of its equipment, tropical plantations, a fleet of ten ocean-going steamships, especially built and constructed for its service, and will shortly add two other steamships now under construction. Its share capital is £450,000, in shares of £1 each. Of these 300,000 shares are fully paid, and on the balance of 150,000 there has been called and paid on each share five shillings, or 25 per cent. Heretofore 50 per cent of the share capital of Elders & Fyffes, Ltd., has been owned by the United Fruit Co. The latter's interest will be increased by the present purchase to 100 per cent. The United Fruit Co. reports the following operations for the nine months ended June 30, 1910: Net earnings, $4,584,087; interest and miscellaneous, $293,485; total net income, $4,877,573; dividends declared, $1,407,992; surplus for nine months $3,469,581; surplus income at close of previous year, $12,006,804; total surplus, $15,476,385; less extra dividend paid November 15, 1909, $2,134,000; balance surplus, $13,342,385.

Messrs. Armstrong, Whitworth & Co., ship builders, Newcastle-on-Tyne, have secured about 70 acres of land on the Tyne side for the extension of their shipbuilding yard, which adjoins the land just purchased. The firm purpose spending over $2,500,000 on these new works, and the site, which has a river frontage of about half a mile, will provide fully for the building and launching of the biggest battleships that are likely to be required for many years to come. This enterprise further will place the Elswick firm in a superior position to any of the shipyards in England for carrying out the requirements of the British or any foreign government for building battleships.

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ACCIDENTS TO LAKE VESSELS

VESSEL accidents were numerous during September, giving the ship yards abundant repair work. There were three total losses, the car ferry Pere Marquette No. 18 which foundered on Sept. 9 on Lake Michigan, the steamer New York, which foundered on Lake Huron on Oct. 2, and the steamer Frank L. Vance, which burned to the water's edge at Milwaukee on Oct. 4.

The steamer Pontiac of the Cleveland-Cliffs Iron Co.'s fleet struck at Watson's Reef, St. Marys river, and was so badly damaged that she had to be beached. She was released on Sept. 13 but was leaking so badly that it was necessary to again beach her to prevent her from sinking. She finally succeeded in delivering her cargo of coal at the Sault, where temporary repairs were made. She was later docked at Cleveland.

The steamer Clifford F. Moll was caught very suddenly in a fog while entering Niagara river and naturally got out of the channel. She swung broadside to the current and it was necessary to lighter 3,000 tons of ore before she could be released. She was taken to Ecorse for repairs.

The steamer Lakeland was struck by the barge John Smeaton in Little Rapids Cut near the Sault, cutting a hole in her from below the water line to the deck. After being temporarily repaired the Lakeland was docked at Cleveland. The cause of the accident was the parting of the wheel-chains of the Smeaton. The Smeaton's steering gear again became disabled in Lake St. Clair and she had the misfortune to shear into the steamer Corunna, knocking a hole about 10 ft. long in her port side forward.

The steamers Harvey H. Brown and D. R. Hanna were in collision in the St. Clair river near Sarnia. The Brown was very badly damaged, it being necessary to put a canvas patch 125 ft. long and 40 in. wide on her starboard side to take her to Cleveland: It will take about two months to repair her.

A curious accident happened to the Maritana of the Pittsburg Steamship Co.'s fleet. In attempting to pick up the barge Maia off Lorain on Oct. 1 she got the Maia's anchor chain caught in her wheel, which wound around the shaft, disabling the Maritana instantly. Dynamite was used to break the anchor chain after which the Maritana was put in dry dock.

The steamer W. S. Mack ran ashore on Poverty Island and was released after 1,100 tons of her cargo of ore had been jettisoned.

Altogether the month was quite prolific in accidents. Following is the summary:

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Sept.	Str. W. A. Rogers.....	Collided with the Gogebic; both boats slightly damaged.....	Buffalo Harbor.
Sept.	Str. Northern Light	Backed into a dock and broke her quadrant; docked at Superior for repairs	Duluth, Minn.
Sept. 7	Str. Wm. J. Olcott.....	Ran into a dock damaging it considerably; steering gear disabled; docked at Ecorse Sept. 15; repairs completed Sept. 20.....	Above Grosse Pt., Detroit River.
Sept. 9	Schr. Challenge	Caught in fish nets and began leaking; vessel was beached and is thought to be total loss.....	Lake Michigan, near Sheboygan.
Sept. 9	C'rf'y. Pere Marquette No. 18	Foundered in storm; cause unknown, but thought to have been after compartment filling with water through broken or open deadlight, followed by bursting of bulkhead; 28 lives lost.....	Off Sheboygan, Lake Michigan.
Sept. 12	Str. Pontiac	Struck, damaging bottom on port side badly; captain beached her in 20 ft. of water; released on 13th, but leaked so badly that she was again beached; delivered cargo at Soo and was temporarily repaired; left Sept. 20 for Cleveland, where she was docked....	Watson Reef, Soo River.
Sept. 12	Str. Milwaukee	Hit pier while leaving port, damaging her bow; went back for repairs	Chicago Harbor.
Sept. 13	Str. Chas. Rietz.....	Damaged while out in storm on lake, sprang leak after entering river and sank	Cuyahoga River, Cleveland, O.
Sept. 14	Schr. J. B. Newland.....	Struck a reef; crew of four rescued and taken ashore.....	Off N. Manitou Island, Lake Mich.
Sept. 15	Str. City of Holland.....	Slightly damaged by fire while tied up near Main Ave. bridge.....	Cleveland.
Sept. 16	Str. Kingston	Broke her shaft at inner bearings; will be out of commission for balance of season.....	Near Kingston, Lake Ontario.
Sept. 16	Mud Scow	Upset by wave of passing steamer; one man drowned.....	Buffalo River.
Sept. 16	Str. Burlington	Struck; docked at Buffalo; No. 1 tank punctured.....	Ogdensburg.
Sept. 17	Str. Clifford F. Moll.....	Stranded on rock bottom in fog; leaked badly; lightered 3,000 tons of ore; released on 24th; docked at Ecorse.....	Niagara River.
Sept. 17	Str. Perry G. Walker.....	Struck; docked at Lorain, Sept. 20.....	Bar Point, Detroit River.
Sept. 18	Str. Wm. M. Mills.....	Tore bridge-tender's house off Muskego Ave. bridge; completely demolished the building.....	Milwaukee.
Sept. 19	Tug Margaret D.....	Struck by Str. Empire City; upper works crushed and badly damaged	Ashtabula Harbor.
Sept. 20	Str. Lakeland	Hit by barge John Smeaton on port bow, cutting hole from 3 to 6 ft. wide from below water line to upper deck; temporarily repaired at Sault; docked at Cleveland, four plates taken off; repairs completed Oct. 5.....	Little Rapids Cut, near Sault.
Sept. 20	Bge. —ohn Smeaton.....	Wheel chains parted and she collided with Str. Lakeland; her stem was pushed in about a foot, towing chock cleaned off and port side hawse pipe broken; temporarily repaired at Sault.....	Little Rapids Cut, near Sault.
Sept. 20	Str. M. A. Bradley.....	Grounded in thick weather; released on 21st, after lightering 700 tons of coal; docked at South Chicago on 28th; sixteen plates damaged	Detroit River.
Sept. 22	Str. Western States.....	Connecting rod of high pressure cylinder broke pushing cylinder head out; temporarily repaired by her engineer.....	Off Long Point, Lake Erie.
Sept. 22	Str. Louisiana	Ran aground; steering gear broke; lightered part of cargo and was released on 24th.....	Below St. Clair Flats Canal Cut.
Sept. 22	Str. Panay	Collided with Str. Boston; both boats slightly damaged, but neither one stopped	Detroit River.
Sept. 23	Bge. John Smeaton.....	Steering gear disabled, causing her to sheer into Str. Corunna, just passing; second accident on down trip; stopped at Ecorse shipyard and then went to Lorain to be docked; 11 plates damaged..	Lake St. Clair.
Sept. 23	Str. Corunna	Struck by barge John Smeaton; hole 10 ft. long cut into forward port side; leaked badly; stopped at Ecorse for repairs.....	Lake St. Clair.
Sept. 24	Str. Bethlehem	Ran ashore; badly broken amidship, spar deck in line with No. 3 hatch having parted about 4 in., break extending to main deck on both port and starboard side; also two other breaks; released Oct. 4; temporarily repaired at S. Manitou Island.....	South Manitou Island, Lake Mich.
Sept. 24	Str. Wilkesbarre	Damaged while in port; docked at Toledo for new wheel.....	Buffalo Harbor.
Sept. 24	Str. D. R. Hanna.....	Collided with Str. Harvey H. Brown, and struck on Middle ground; released on 25th, after lightering 300 tons; towed to Reid's dry-dock, Sarnia, for temporary repairs; will be docked at Superior..	St. Clair River, near Sarnia.
Sept. 24	Str. Harvey H. Brown.....	Collided with D. R. Hanna and struck bottom; released and taken to Cleveland to be docked; when she arrived at Cleveland had canvas patch 125 ft. long and 42 in. wide on starboard side; spar deck torn away from side of ship and in a number of places	

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		was pushed up several ft.; will take about two months to repair her; 100 ft. of starboard side and 50 ft. of deck taken off in drydock	
Sept. 24	Tug Rooth	Stripped all buckets off her wheel on sunken obstruction	St. Clair River, near Sarnia.
Sept. 25	Str. United Lumberman	Severely damaged by fire; cabin burned off and several people burned, but no lives lost; loss, $5,000	Near Port Huron, St. Clair River.
	Str. Leonard P. Miller	Steering gear disabled in heavy sea; anchored at Cove Island and then went to Detour	N. Tonawanda, N. Y.
Sept. 27	Str. Sierra	Couple of buckets thrown off her wheel	Lake Huron.
	Str. W. S. Mack	Ran ashore; three tanks punctured; released Oct. 4, after jettisoning 1,100 tons of ore; went to Escanaba for temporary repairs	Ashtabula Harbor.
Oct. 1	Str. Maritana	In endeavoring to pick up barge Maia caught Maia's anchor chain in her wheel shaft and was seriously damaged; dynamite used to break anchor chain; docked at Lorain	Poverty Island, Green Bay.
Oct. 2	St. Bge. L. L. Barth	Sprang a leak in heavy sea on Lake Michigan; sank in 20 ft. of water near dock, for which she headed at full speed when leak was discovered; crew taken off by life-savers	Lake Erie, off Lorain.
Oct. 2	Str. New York	Foundered in storm; crew rescued from yawl boats by Str. Mataafa, passing; heavy seas caused leak which put out fires; pumps were of no use. Total loss	Muskegon, Mich.
Oct. 3	Str. Phenix	Ran ashore	Lake Huron.
	Str. Honduras	Struck; docked at Superior	Poplar Pt., Lake Ontario.
Oct. 3	Str. Gogebic	Dragged her anchors and went on beach under breakwater	Buffalo.
Oct. 4	Str. Frank L. Vance	Burned to water's edge; crew rescued	Detroit River.
			Off Ludington, Lake Michigan.

CASTING LARGE PROPELLERS IN MONEL METAL

BECAUSE of its resistance to corrosion, its strength and the readiness with which it may be machined, Monel metal, a comparatively new alloy of nickel and copper has made its appearance as a growing factor in foundry practice for certain classes of castings. Illustrating the broadening use of this metal, a new and modern foundry especially designed and applied to such casting practice has recently been erected and put in operation by the Bayonne Casting Co., Bayonne, N. J. This plant is the only one of its kind devoted exclusively to the melting of this alloy and its capacity for such work is on a large scale.

There is now being carried on at this plant some interesting work, among which is the casting of large propeller wheels for battleships of both the United States and foreign countries. Recently there was taken by this company a contract for the manufacture in Monel metal, of the twelve propeller wheels for two large battleships now building for the Argentine Republic in the yards of the Fore River Ship Building Co., Quincy, Mass., and the New York Ship Building Co., Camden, N. J. These will be in one piece, about 15 feet 6 inches in diameter, and will weigh 16,000 pounds each, and together constitute the largest contract for Monel metal castings ever placed. The company also has on hand the casting of four propeller wheels for the United States battleship Florida, which was recently launched in the

FIG. 1—MOLD FOR A 16,000-POUND MONEL METAL PROPELLER, IN A STEEL-LINED PIT

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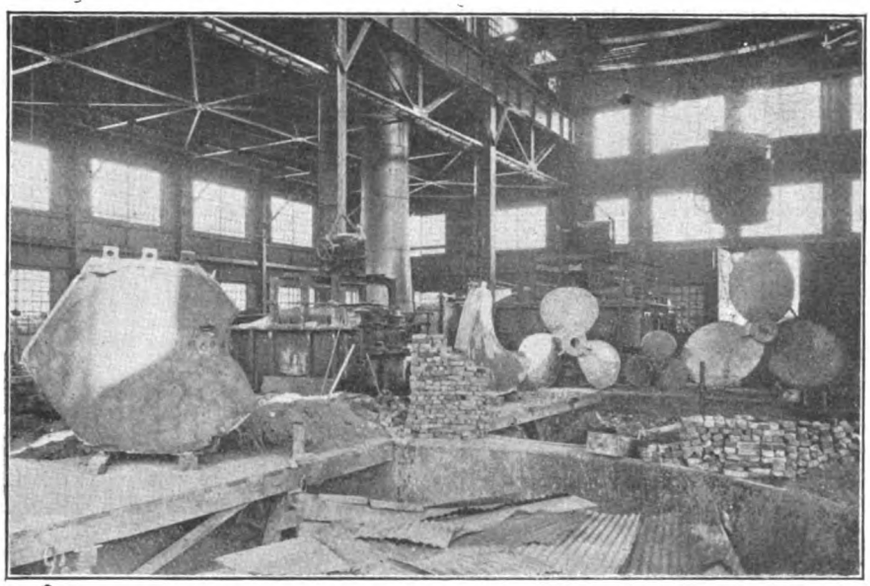

FIG. 2—VIEW OF ONE END OF THE MONEL METAL FOUNDRY OF THE BAYONNE CASTING CO. THE FURNACES ARE SHOWN AT THE LEFT AND A MOLD IS BEING DRIED IN THE PIT IN THE FOREGROUND

Brooklyn navy yard. These will be in one piece, 10 feet 6 inches in diameter, and will weigh about 8,000 pounds each.

Casting Practice.

The practice of casting Monel metal is very similar to that followed in steel foundries. The melting equipment of the plant consists of standard reverberatory furnaces which are oil-fired, the fuel being fed by gravity. There is no forced draft, the melting being done by natural draft. The metal is charged into the furnace in the form of pigs or slabs, which are each about 15 x 8 x 3 inches in dimensions and weigh about 85 pounds each. The melting point is high, being about 2,500 degrees Fahr. and eight hours are required to the heat. No fluxes or alloys are necessary. Because of the relatively scant knowledge of nickel and its peculiarities, the use of Monel metal in the foundry requires expert attention in melting. The melting capacity of the Bayonne Steel Casting Co. is about 40,000 pounds daily, consisting of one furnace capable of producing 30,000 pounds, one of 7,500 pounds and one of 2,500 pounds. Several Rockwell furnaces of 200 pounds capacity each for brass work are also included in the shop equipment.

Casting Propellers.

The casting of the large propeller wheels is interesting. The pits used are 25 feet in diameter and 5 feet deep, and are in the form of submerged steel tanks, built of rolled plates. This type of construction was adopted because of the shifting nature of the ground upon which the shop is located due to its proximity to tide-water, and in preference to cement because of the lower cost. An ordinary loam mold for the casting is built up on the pit bottom or base plate. Millville gravel from nearby New Jersey deposits is used, and this is the same grade of sand which has been adopted by the steel foundries of that locality. An especially good sand and facing are required because of the heat of the molten metal, which exceeds that of steel when poured. The ramming is done by air rammers of the floor type. After the mold is in position and dried and the pattern drawn, the copes are bolted on to the base plate. A runner box with four apertures which feed directly into the mold is placed upon the copes and the head box inserted. The feeding is done quickly from a 30,000 pound ladle into which the furnaces are tapped. Rapid pouring is necessary for the elimination of dross that otherwise might collect. The

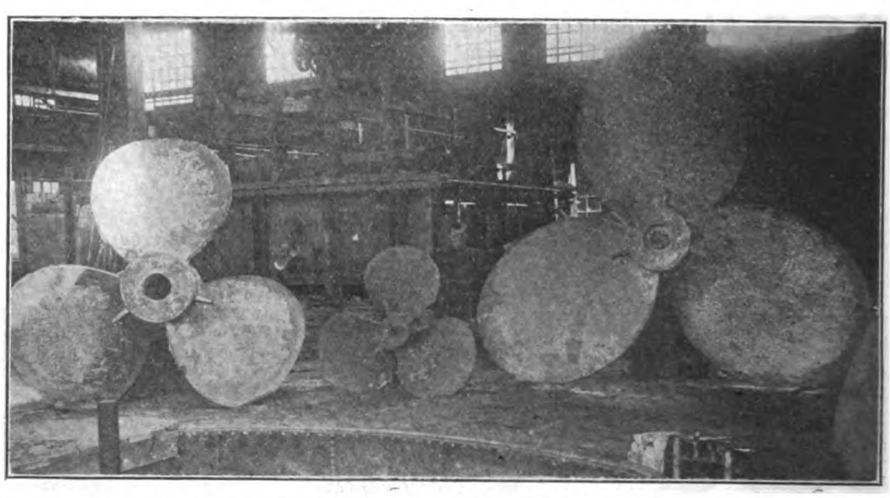

FIG. 3—COMPARATIVE SIZES OF PROPELLERS CAST IN MONEL METAL

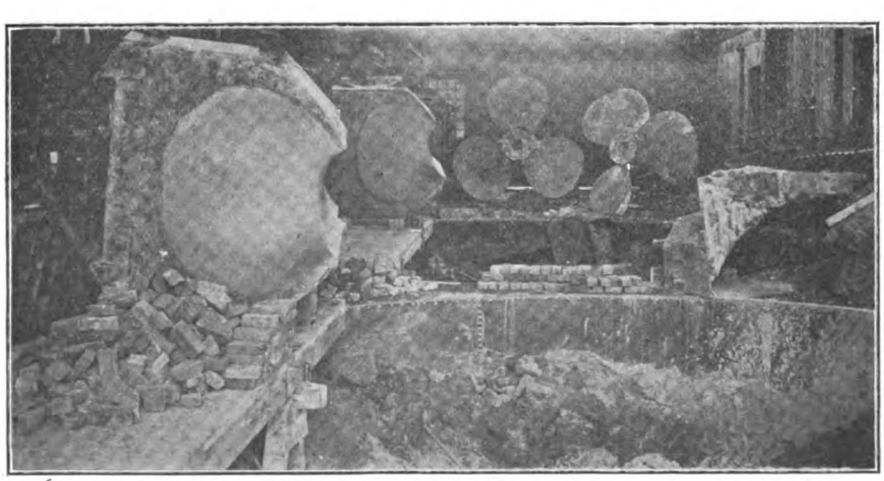

FIG. 4—COPES FOR A PROPELLER MOLD ARE SHOWN AT THE LEFT; WHEELS FOR THE U. S. S. FLORIDA ARE IN THE BACKGROUND

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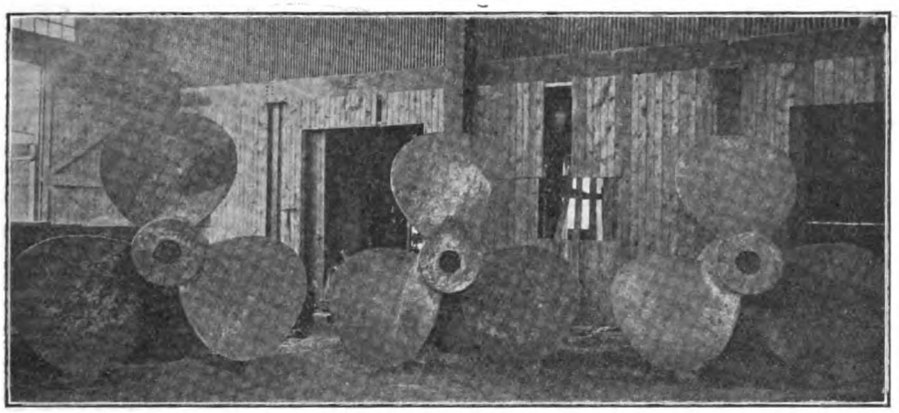

FIG. 5—THREE 8,000-POUND PROPELLERS, CAST IN MONEL METAL, FOR THE U. S. S. FLORIDA

molten metal pours quite similar to brass. The casting is allowed to set for four days in the mold before it is shaken out. One 20-ton Morgan electric traveling crane with a 5-ton auxiliary of the same type command the operations, and there are also two 7½-ton jib cranes which serve for the handling of the material in about one-third of the entire shop.

Assays and tests of each heat poured are taken. The following results on physical tests were shown by pieces recently cast in sand from heats of the Bayonne Casting Co.: Tensile strength, 72,283-81,609 pounds per square inch; elastic limit, 35,920-40,731 pounds per square inch; elongation in 2 inches, 38-28½ per cent.

Suitability for Marine Service.

Its strength and non-corrosive properties make Monel metal castings especially suitable for marine service in such parts as propellers, pump fittings, valves and valve fittings which are exposed to water. Molding machines are used in the manufacture of the smaller parts. The first propeller blades of Monel metal were adopted by the United States government about 18 months ago for the battleship North Dakota. Recently, in dry dock, an inspection of these blades was made, which showed that they had suffered little effect of their long service. A number of torpedo boat destroyers now in service are also equipped with propellers manufactured of Monel metal. Another use to which the metal has been recently put is in the manufacture of pickling frames for tin plate works. The acid bath into which these frames are plunged for cleansing the rolled plates has little effect upon the casting.

Composition of the Metal.

Monel metal is composed of about 68 per cent nickel, 27 per cent copper and the balance of iron and manganese in about equal proportions. The special properties claimed for it are its extreme non-corrosiveness, its high modulus of elasticity and its strength, which is said to be greater than that of steel. It is slightly magnetic and can be welded, brazed, soldered, forged or drawn. It is now commercially produced in a variety of forms such as ingots, hot or cold rolled rods, sheets, wire and castings. It machines very much as mild steel and at about the same speed. It is produced as raw material by the Orford Copper Co., New York City, a subsidiary of the International Nickel Co. The physical properties of the alloy are given as follows:

Melting point, 1,360 degrees Cent., (2,480 degrees Fahr.); specific gravity (cast), 8.87; weight per cubic inch, 0.319 pounds; electrical conductivity, 4 per cent (copper 100 per cent); heat conductivity, 1/5 that of copper; modulus of elasticity, 23,000,000; shrinkage, ¼-inch per foot.

Largest French-Built Liner

Although not equal in size to the Cunarders Mauretania and Lusitania, the new turbine liner France, building for the Compagnie Générale Trans-Atlantique, for service between Havre and New York, which was successfully launched in September, at the Penhoüt yard of the Chantiers de l'Atlantique, St. Nazaire, will be the largest merchantman under the French ensign, and, at the same time, the largest boat as yet built in France. Speed and the character of her accommodation are both being attended to with great care, and in other respects she will embody many new features, and will consequently take a place in the front rank among modern liners. She is, indeed, the latest embodiment of the enterprise that animates the French Trans-Atlantique Co.

Built at St. Nazaire by the same firm as was responsible for the La Provence, Chicago, and other first-class boats, her success is assured. She will be engined by her builders, who are licensed to construct Parsons turbines. The vessel's principal measurements are: Length over all, 715 ft. 3 in.; breadth over all, 75 ft. 3 in.; depth from houses to keel, 78 ft. 9 in.; draught, 29 ft. 6 in.; gross tonnage, about 23,000 tons; displacement, 27,000 tons; I. H. P., 45,000; anticipated speed, 23½ knots. She is of the 8-deck type, and will carry some 2,000 passengers.

In order to insure stability, she has been fitted with bilge keels for over half her length; thus she will easily resist rolling in a seaway. Twelve watertight bulkheads divide the ship into 13 watertight compartments, which added to the 16 compartments of the double bottom, make the vessel practically unsinkable. She will be propelled by four screws, driven by two sets of Parsons turbines. There will be two H. P. and two M. P. ahead turbines driving the wing propellers, and two L. P. ahead turbines connected with the astern turbines and driving the central shafts. The four-bladed propellers are of manganese bronze. Steam will be supplied to the main engines and auxiliaries by four groups of boilers extending 279 ft. in length, or nearly one-third of the ship's length. These boilers are either single-ended with four furnaces or double-ended with eight furnaces each, and work at 200 lb. pressure. The boilers will be operated with Howden's forced draft system, which gave such good results on board previous liners belonging to the same company. The four funnels rise 112 ft. above the grate bars; their elliptical axes are respectively 17 ft. 6 in. and 13 ft. 5 in. The main and auxiliary condensers, it is interesting to note, are of the "Contraflo" type. The vessel will be fitted with wireless of the latest type, and also submarine signalling apparatus. Twelve sets of Welin quadrant davits are fitted.

Not only size and speed will entitle the France to be called the largest and speediest liner of the French mercantile fleet, but probably her most remarkable features will be the luxuriousness and the refinement of the internal decorations. The main impression aimed at will be one of simplicity, but of calculated intent.

The tow boat Leader of the fleet of the Monongahela River Consolidated Coal & Coke Co., was burned on Sept. 27 on the Ohio river near Economy, Pa.

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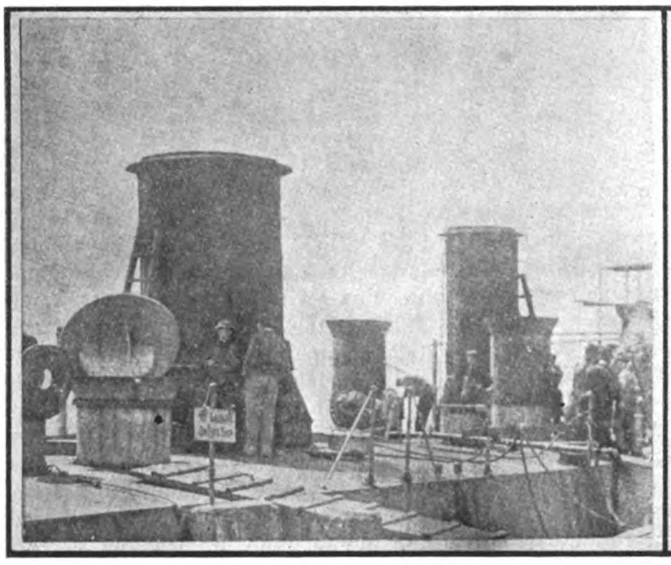
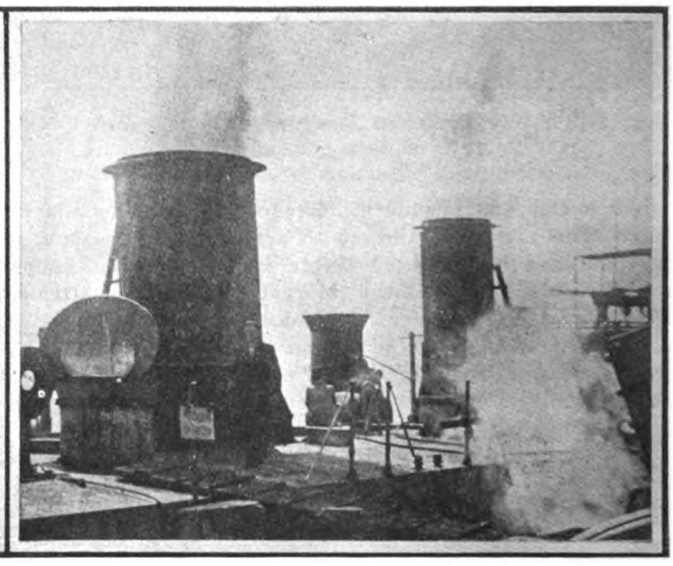
Oil Fuel on Destroyer Roe

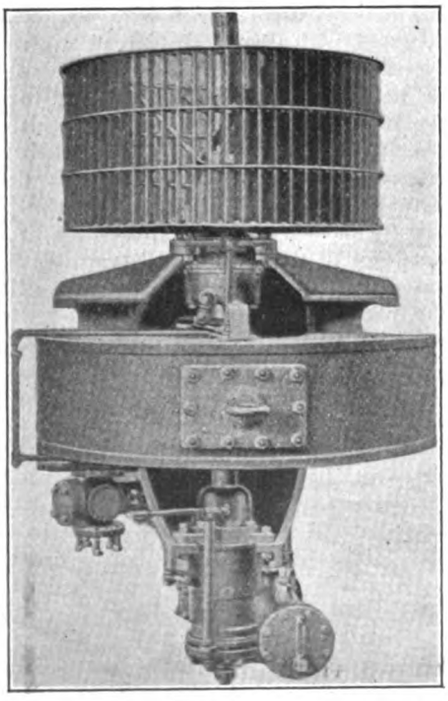
Considerable interest attaches to the recent tests of oil fuel apparatus on the torpedo boat destroyer Roe, built by the Newport News Ship Building & Dry Dock Co., and delivered to the government on July 14. The Roe is the first of the destroyers designed for oil fuel to be delivered and the department officials have in consequence been deeply interested in the working of the system.



STACKS OF UNITED STATES TORPEDO BOAT DESTROYER ROE, DURING TEST WITH 3-IN. W. G. AIR PRESSURE.



UNITED STATES TORPEDO BOAT DESTROYER ROE, SHOWING SMOKE WITH 3.2-IN. W. G. AIR PRESSURE WITH OIL BURNERS OPENED EXCESSIVELY.



"SIROCCO" FORCED DRAFT FAN WITH DIRECT-CONNECTED STEAM TURBINE ON NEW TORPEDO BOAT DESTROYERS.

Although the use of fans for forced draft and ventilation is common in all navies and in the merchant marine and for supplying blast to oil burning forges and furnaces in industrial plants, it is believed that the United States navy has, in these destroyers, made the first applicaton of fan blast to the burning of oil in naval vessels. The fans adopted on the Roe are of the "Sirocco" type, of vertical design, and direct driven by Terry steam turbines. The fans have a diameter of 30 inches but are supplying 2,300 cubic feet of air per minute at 5-inch water pressure and at 1,400 revolutions per minute. The entire design involves many intricate problems, which were, as the tests demonstrated, satisfactorily worked out by the American Blower Co., builder of the apparatus.

The boilers of the Roe are of the Thornycroft water tube type, built by the Newport News Co. The accompanying photographs, taken during dock trials, show the almost entire absence of smoke, even under abnormal conditions.

The enlisted man in the navy is said to be very much interested in oil fuel and in the consequent abolition of the dirty job of "coaling ship," an expression which will now have to give way to "oiling ship."

Trade Notes

The Welin Davit and Lane & DeGroot Co., Long Island City, N. Y., just received a letter from their London house, an extract of which follows:

"Some years ago, we fitted the R. M. S. Aragon with two sets of Quadrant Davits, the R. M. S. Araguaya with four sets and subsequently the Amazon and the later boats the Avon and Asturias throughout. The first-named of these vessels has now come in for refit, and the owners have decided, notwithstanding the expense, to dismantle and discard the old type of davit, and to refit the ship throughout with Quadrant davits. We have this morning received the order to execute this work."

The Atlantic Works, Inc., Twenty-eighth street and Gray's Ferry road, Philadelphia, have recently shipped one of their B 17 bevel band saw machines to the Old Dominion Steamship Co., for their plant at Suffolk, Va., and one of them to the Henry Diebert Barge Building Co., for their new yard at Chesapeake City, Md.

The Safety Car Heating & Lighting Co., 2 Rector street, New York, have just issued the first number of "Safety Heating and Lighting News." The purpose of this particular number is to provide detailed information of various equipments of the company for railroad use. The edition is well printed, is copiously illustrated and contains much matter of interest in relation to the lighting and heating of railroad cars.

The Canada Foundry Co. has purchased the plant of the Canadian Ship Building Co., at Bridgeburg, Ont., and will turn it into a structural steel plant.

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Mr. Newberry and Navy Yard Management

By Rear-Admiral Caspar F. Goodrich, U. S. N.

(Reprinted from *The Independent.*)

THE subject of the organization and administration of our naval establishments on shore has received much attention of late through the measures of reform introduced by Sec. Newberry, through the steps taken by Sec. Meyer to give effect to his own views on this inportant topic, and through the investigations by the House Naval committee, now accessible to the public in a volume entitled "Hearings on the Proposed Reorganization of the Navy Department Before the Committee on Naval Affairs of the House of Representatives." Much was done by Mr. Newberry, who with one stroke abolished the multiplicity of shops and gathered all operations of like nature under one head and substantially under one roof. For reasons which he has announced in several places and on several occasions, Mr. Meyer has thought best to create two main divisions of navy yard activity, one dealing with the "hulls" of vessels, the other with their "machinery." This action on Mr. Meyer's part has served to make more clear than before the necessity of developing a body of skilled "shop managers." So far as the navy on shore is concerned, this has been and still remains a pressing want.

Familiarity with Shop Management.

Only those who are familiar with mechanical processes and the ways of our largest and most prosperous manufacturing corporations can realize that a man whose knowledge, training and personal force enable him to get out of machinery and employes the maximum of profit is almost beyond price. The writer, on one occasion, when seeking a competent superintendent for a great constructional branch of the Government, applied for help to a certain well-known ceptain of industry. This was the answer received:

"What pay can you give him? If $25,000 a year, I know your man; if $15,000, there are two or three who might serve; if only $5,000, the woods are full of them. I give my superintendent $50,000 and make money. It would be poor economy to hire a $10,000 man and lose money. If Mr. Blank wanted $100,000 a year he could have it for the asking."

How can the navy hold its own against such men as Mr. Blank? Let us see how the case stands before giving up all hope. In the first place Congress cannot, if it would, sanction any such compensation as is required to secure the one man whom the writer's friend had in mind. With difficulty is it induced to grant even so much as $3,000 per annum. Since the skilled talent the navy needs of this nature may not be purchased in the open market, recourse must be had to intelligent officers subject to the department's authority. In them it has, to begin with, loyalty, ambition and marked capacity, a most promising foundation upon which to build its edifice of training. What, speaking generally, does this expression "training" imply?

Methods of Management.

While there are various schools or methods of shop management, all which deserve study or adoption are based upon actual knowledge of what work any machine or any mechanic is capable of turning out in a given time. The day of rough guessing and of the rule of thumb is passed; that of exact scientific direction has dawned. The machine is so geared and driven as to be crowded to the limit of its power under minute specific instructions governing every step of the operation. These instructions are issued from an office wherein are kept the records of countless observations and computations, which result in a perfect understanding of what any given tool may be made to accomplish. Nothing is left to the judgment of the employe. However competent, his wisdom cannot rival, much less exceed, the combined wisdom of many investigators acting for long periods of time on a well-defined plan, and measuring, counting and tabulating the phenomena they witness without prejudice or favor. This instance is but one of many, none of which can be neglected if we seek to secure the best results. The care, speed and tension of belts, the change in methods necessitated by change of the metal to be cut, since wrought iron, cast iron, brass and steel (according to its quality) each demands its own peculiar treatment; the value of the various kinds of tool steel for each class of work; the way to fashion wood with rapidity and without undue waste; the number of rivets which can be well driven in a stated time; the number of square feet of pigment applied to diverse surfaces; the number of tons of coal or sand a well-taught laborer may shovel in a day; the number of cubic yards of soil he can excavate, whether clay, loam or hard pan; the economic handling of weights to avoid retracing their path; the latest improvements and devices in machinery, etc., may be mentioned as part of what a manager must learn to reach the high-water mark in his proficiency. Now these things can only be acquired after long experience by a man who, making them his particular aim, devotes to them time, thought and patient industry. Books, pamphlets and articles in the technical journals must be conned over and their applicability to the work in hand determined; other shops must be visited for the lessons they teach or for the warnings they convey; from intelligent and successful superintendents hints must be extracted as to the best ways of laying out and carrying on the different classes of undertakings. These things combine to form a school whose sessions never cease and from which the student will gain in proportion to his own mastery of the subjects taught. Above all, he must keep in touch with those who make shop management in its broadest sense their individual specialty.

What the expert in this respect can accomplish may be seen in a few only of the many cases that might be cited. In the first place, his methods are grounded on a universal skepticism. He takes nothing for granted; whatever is, may be right or it may be wrong; analysis and demonstration alone will show. Every operation, whether manual or mechanical, he holds to be governed by some law which it is his duty to determine. For example, nothing would be simpler than to pick up pigs of iron from a pile alongside a railroad track, carry them up a gangplank and stack them on a platform car; yet this handling is subject to a physical law so manifest after explanation that we wonder its importance has not before been generally realized. After carrying a number of pigs, in the manner described, the laborer feels fatigue and in consequence he slackens his speed. What has happened? The muscles of his arms, back and legs have been depleted of their vital tissue in spite of the fact that his blood circulation has been greatly stimulated. The waste,

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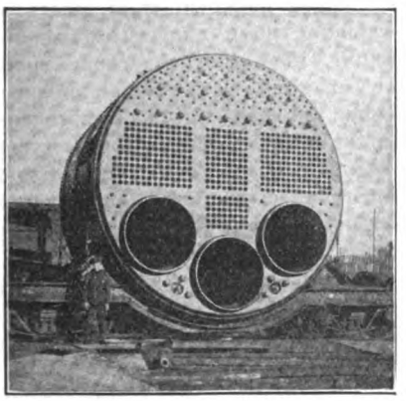

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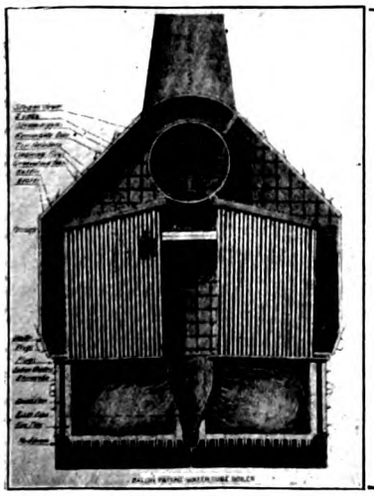

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it appears, is greater than the supply. Let him rest a few moments, the waste will be quickly repaired and the man will be quite fresh and vigorous again. Since he is paid by the ton, he is, naturally, unwilling to stop in his work lest, as he fears, he may suffer in pocket. After some persuasion, one such laborer was induced to move for a whole day under specific orders from an expert who stood by him with stop watch and recording tablet in hand. To the workman's surprise, his tons had multiplied in number and yet at the end of the day he was no more tired than he had been previously when toiling after his own fashion. It seems hardly creditable, although it is true, that with only a good average laborer engaged on this job, the amount of iron thus moved habitually has risen from twelve and a half tons to forty-seven and a half tons in ten hours.

Guess Work Eliminated.

In the case of a machine, guesswork is eliminated. The expert counts the teeth in its gears, measures its parts and ascertains the strains and stresses it can bear. Then he adjusts the width and tension of the driving belt so that the latter furnishes the maximum power which the machine can utilize without risk of damage. When a piece of metal has to be reduced in size through turning or planing, he solves, by a peculiar graphic appliance, an equation which represents mathematically the character of this particular mechanism and the work it is called upon to do. This equation contains sometimes as many as nine variable quantities. The expert gets, as his result, the speed at which the machine should be driven, the depth of cut and the rate of the feed to the cutting tool. Using these figures, the mechanic obtains at once the utmost of which that particular apparatus is capable with safety. In one admirably equipped factory under an excellent manager of the old school, the expert took the latter's best man and best lathe, worked out his little equation and immediately more than doubled the output. Extending his investigations throughout the works, he increased the product of every machine not less than twice and in some instances nine times; all this through the substitution of science for empiricism.

Arousal of Interest.

Under the new order of things, the employes' interest is aroused and his co-operation enlisted by assuring him, first of all, the standard daily wage of his neighborhood, and, secondly, by paying him a liberal bonus for doing any job in less than the time allotted by the detailed written instructions he receives. It is quite customary for a man to get 30 per cent extra in his pay envelope at the end of the week, while not infrequently his bonus runs up to 50 per cent or even 60 per cent. Is it astonishing that the operatives themselves welcome such a system?

Nor can the human element be ignored. A firm yet tactful dealing with his employes is not less essential than a full understanding of machinery. In this respect, men differ as widely as the poles. To some this important faculty comes by intuition; to others, as the consequence of study and experience; to more again, it can never come at all. The metier of the last is by nature distinctly not that of the shop manager. The mere holding of a commission in the navy will, therefore, not suffice, whether it be in the line or in the corps of constructors. Some of the requirements in this connection are absolutely mandatory, viz.: Natural aptitude for the calling; a broad groundwork of technical knowledge; some shop experience, wherein quality rather than quantity counts (for too much time passed in a poorly fitted out and slackly administered shop may easily be worse than none at all); entire devotion to this pursuit, to the exclusion, for the time being, of all other ambitions. It would also appear as if extended assignments to this duty were unavoidable. It is only in meeting these exacting conditions unreservedly that the navy can hope to achieve industrial results comparable with those reached daily in private establishments. As the logical outcome of his deliberations on this question, Secretary Newberry found himself driven to look to the naval constructors to develop into trained, scientific managers (for these officers never go to sea), yet, even among their number, some, he knew, would prove deficient in those traits of character which the true shop manager must possess, and so they would gradually drift into other professional employment where their abilities would be equally valuable to the Government. Through this weeding out of such of the constructors as gave no hope of becoming good managers, a competent and skillful staff would, he expected, remain to push on the navy's work on shore and introduce those economies which all recognize as large and yet attainable.

Long and Toilsome Road.

From what has been said it may be seen that a good organization having been established in our navy yards, much still remains to be done to develop, under the system finally adopted as on the whole best suited to the Government's needs, a set of men able to make that organization thoroughly efficient. That this will be the eventual outcome cannot be doubted by those aware of the earnestness and energy with which other correlated problems have been attacked. But the road is long and toilsome, calling for courage, perseverance and faithful labor on the part of all entering upon it and justly demanding patience and a suspended judgment from others who, watching these efforts toward better things, hope that they may speedily be crowned with complete success. None the less, a right comprehension of the ultimate end, of the best means to that end and of the difficulties that must be encountered and overcome seems not only prudent but indispensable.

Mr. Newberry's grasp of the situation, his share in bringing about a better state of things and his proposed solution of this knotty problem are too important not to warrant study and recognition.

Liability of Vessel for Injury to Another

An oil-burning steamer, lying beside Long Wharf at Oakland, in San Francisco Bay, discharged a considerable quantity of inflammable fuel oil from her hold into the waters of the bay, which was carried by the wind and tide under the wharf, where, mixing with the floating debris, it formed a mat. The wharf was 90 feet wide, supported on piles, and there were vessels lying on the opposite side. The floor of the wharf was in places soaked with oil which had escaped from oil-burning engines used thereon. By some accidental means the inflammable mat formed on the water was set on fire, burning a portion of the wharf, and also injuring libelant's vessel lying on the other side, and around which the oil floated. Held, That the negligent act of the steamer in discharging the oil into the bay was the proximate cause of the injury, which, with knowledge of the inflammable character of the oil, the adjacent wharf on which men and engines were working, the surrounding vessels, and the prevailing wind and tide, should reasonably have been anticipated, as a probable consequence.

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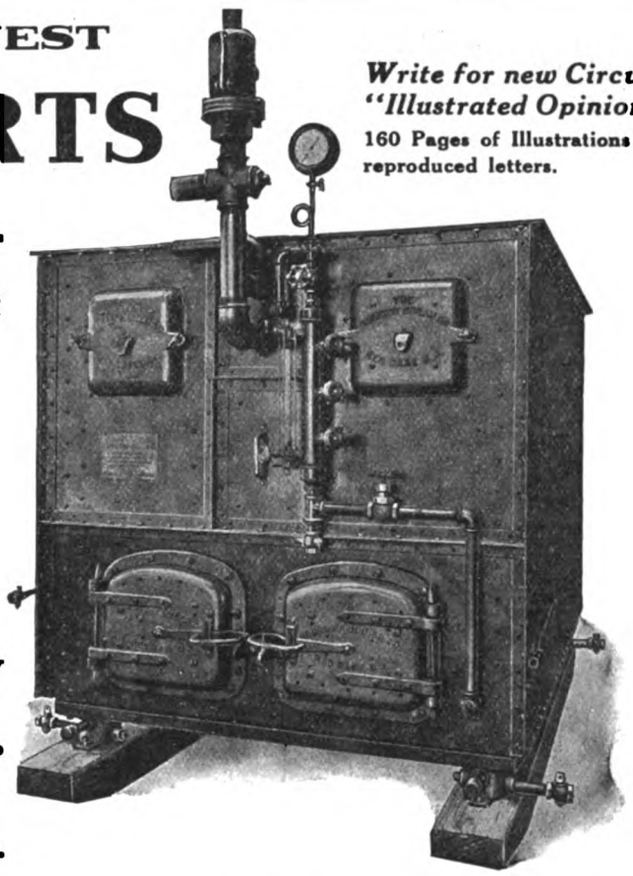

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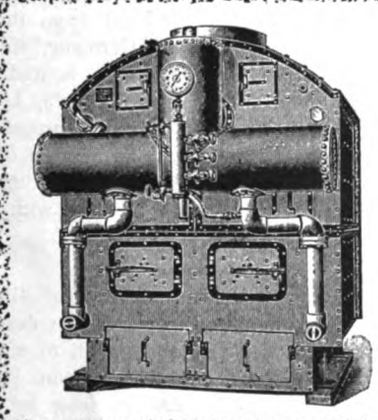

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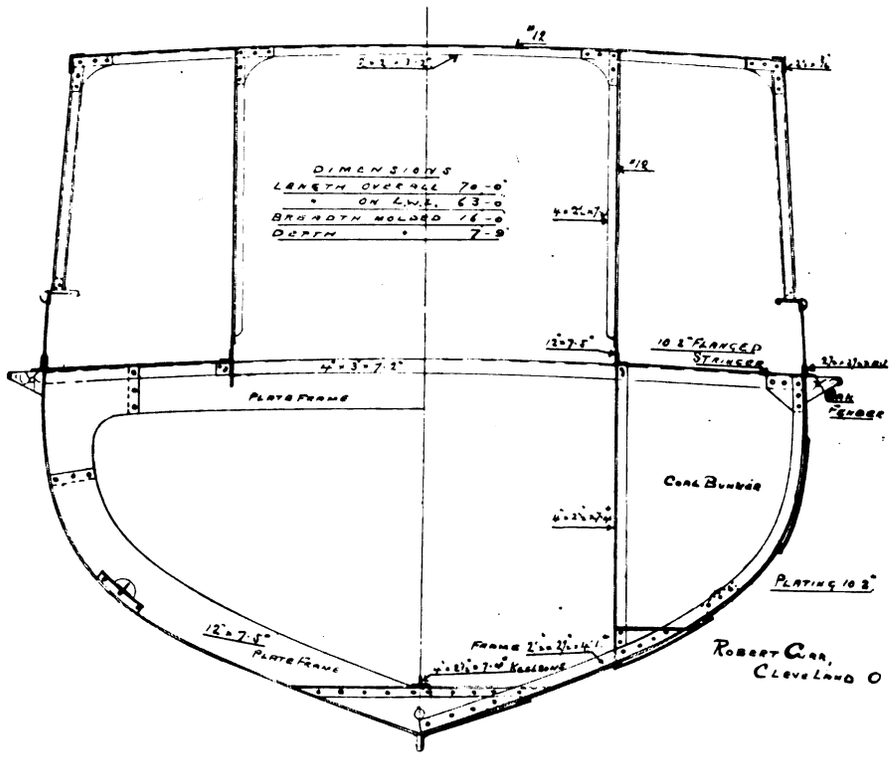
Fishing Steamer for Case Fish Co.

Robert Curr, naval architect, is building a small fishing steamer for the Case Fish Co., at the works of Murphy & Donnelly, Cleveland. The steamer is 70 ft. over all, 63 ft. on the water line, 16-ft. beam and 7 ft. 9 in. deep. The engine is high pressure, 14 x 14 in., supplied with steam from a Scotch boiler, 5 ft. 6 in. diameter and 10 ft. long. The little vessel is up-to-date in every respect, having plate frames spaced 40 in. apart, dispensing with hold stanchions. The bunkers are self-trimming and so arranged to allow ample space to get around for painting and keeping in good order. The forepeak is arranged for carrying ballast and is thoroughly stiffened. The plating is doubled 24 in. above and below the water line, and a 12-in. plate forming a breast hook is fitted to the shell plating on the load water line, making the vessel amply strong in resisting ice floes. The only wood used is an oak fender, which runs all around the vessel. As the steamer was built two squares away from the river, she was carried on rollers to the old river bed and launched on Monday, Oct. 10.



MIDSHIP SECTION OF FISHING STEAMER.

The Northern Dredge & Dock Co., Duluth, were the lowest bidders for dredging in Marquette harbor, their bid being 19 cents per cu. yd.

Larsen's Trip Through Niagara Rapids

Capt. Klaus P. Larsen successfully shot the Whirlpool Rapids in the Niagara river on Sunday, Sept. 18, in an open 18 ft. power boat. It is unfortunate that comparatively few persons saw this notable achievement. About 100,000 persons had gathered along the Gorge Railway and on the bluffs, but Larsen did not start on schedule time and an hour or two later it was announced that his boat had been seized by the authorities. The fact was that Larsen had been maneuvering his boat at the base of the falls and had temporarily deranged the machinery through driftwood catching in the wheel. As soon as this was adjusted, however, he started down stream in the gathering dusk and probably not over 200 persons altogether witnessed his feat. He held to the center of the channel and had his boat under perfect control at all times. In encountering the Giant Wave his boat was thrown somewhat obliquely toward the American shore but he righted her course instantly with the tiller. He successfully avoided the Whirlpool and sped on towards Lewiston, the perfect master of the situation. By this time, however, he had shipped sufficient water to drench the ignition system, which had not been waterproofed, and his engine came to a stop. His boat was then caught in one of the numerous eddies and drifted to the American shore about a mile and a half above Lewiston.

This was the first boat to have made the trip under power since the Maid of the Mist shot the rapids in the 50's. If this trip has accomplished nothing else, it has demonstrated that the terrors of the Niagara Rapids are more imaginary than real. There are no rocks in the channel. The power boat was of the ordinary open sea type, 18 ft. long and 5 ft. 2 in. beam, built by the Cleveland Auto Boat Mfg. Co., of Cleveland, and equipped with a Ferro engine. The cockpit was decked completely over with the exception of a hole about 2½ ft. in diameter in which Larsen stood. Around this opening a tarpaulin was stretched which during the voyage was wound tightly around his waist.

A reinforced concrete barge to be used for carrying dredging spoil has recently been launched at Stolp, Pomerania. Of the four holds, into which it is divided, the inner two are open and receive the spoil, while the outer two are covered and act as air chambers to keep the vessel afloat. The boat has a length of 33 ft., a beam of 13 ft. and a depth of 5 ft. 3 in.; its draught, light, is 20 in.

In consequence of the excellent results of the destroyers fitted with the Zoelly marine turbine, the German naval authorities have ordered from the Germania yard at Keil, Germany, six more boats thus equipped. It is understood that the torpedo boat G 173, built by Messrs. Krupp & Co., and propelled by Zoelly turbines, attained a speed of 33.35 knots at her trial. This is the first German warship to be fitted with Zoelly turbines.

Messrs. Yarrow & Co., of Glasgow, have at present in hand two destroyers for the British government, of a special type. They are building, in Holland, two destroyers, 230 ft. long by 21 ft. 6 in. beam, for the Dutch government. They also have in hand one destroyer for the Portugese government, the hull of which is being built in Lisbon and the machinery and boilers supplied from Messrs. Yarrow's Works at Glasgow. They are also building two fast gunboats, propelled by internal combustion engines, for the governor general of Bagdad.

The Skinner Ship Building & Dry Dock Co., Baltimore, launched the steel tug Comet, building for the Hartford & New York Transportation Co., on Aug. 26.

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